SCIENTIFIC AMERICAN

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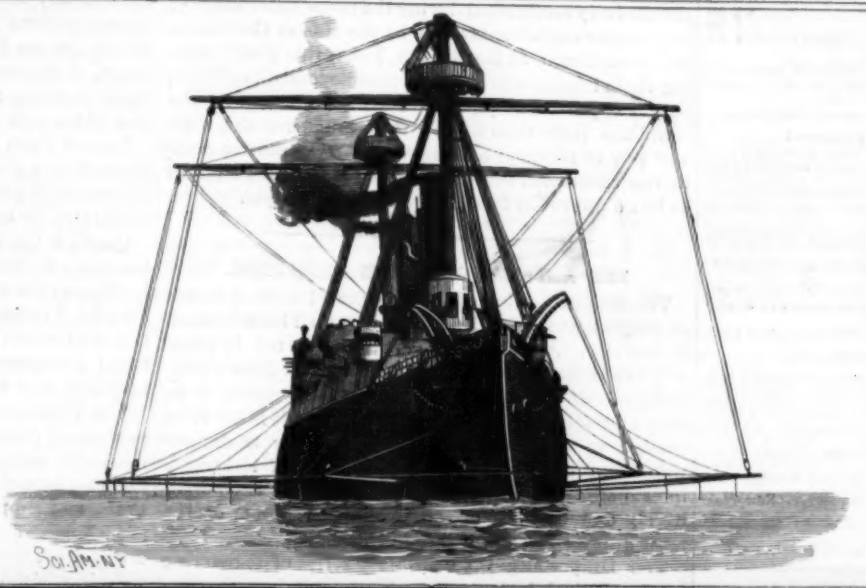
A TORPEDO BOAT FLOTILLA ATTACK THE ATLANTA.

A sham battle, intended to illustrate the conditions of modern naval warfare, and the means which the most improved ironclads have for defending themselves against the attacks of torpedo boats, came off at Newport, R. I., on the night of October 11, according to a prearranged plan of Admiral Luce, of the North Atlantic Squadron, and a board of officers. The new cruiser Atlanta, which, with the Richmond, the Dolphin, and other vessels of the squadron, had arrived at Newport, was made the target of a supposititious attack by the steam launches, cutters, whaleboats, and gigs of the other vessels of the squadron, simulating torpedo boats. The Atlanta was defended by her own resources and such improvised



additions as her officers could make effective.

According to the plan arranged for the fight, approaching boats were to be ruled out of action and retire when discovered by the Atlanta in time to be under the fire of heavy guns long enough to receive three rounds therefrom, or under a Gatling gun fire within five hundred yards for a minute and a half, or under a small arms fire for the same time, or under an effective fire during fifteen seconds while within the beams of the search lights, or be within effective range of a defense torpedo at the time of its possible explosion by the Atlanta. Any torpedo boat succeeding in attaching an explosive charge to any part of the defense, or any torpedo boat which, without being dis-

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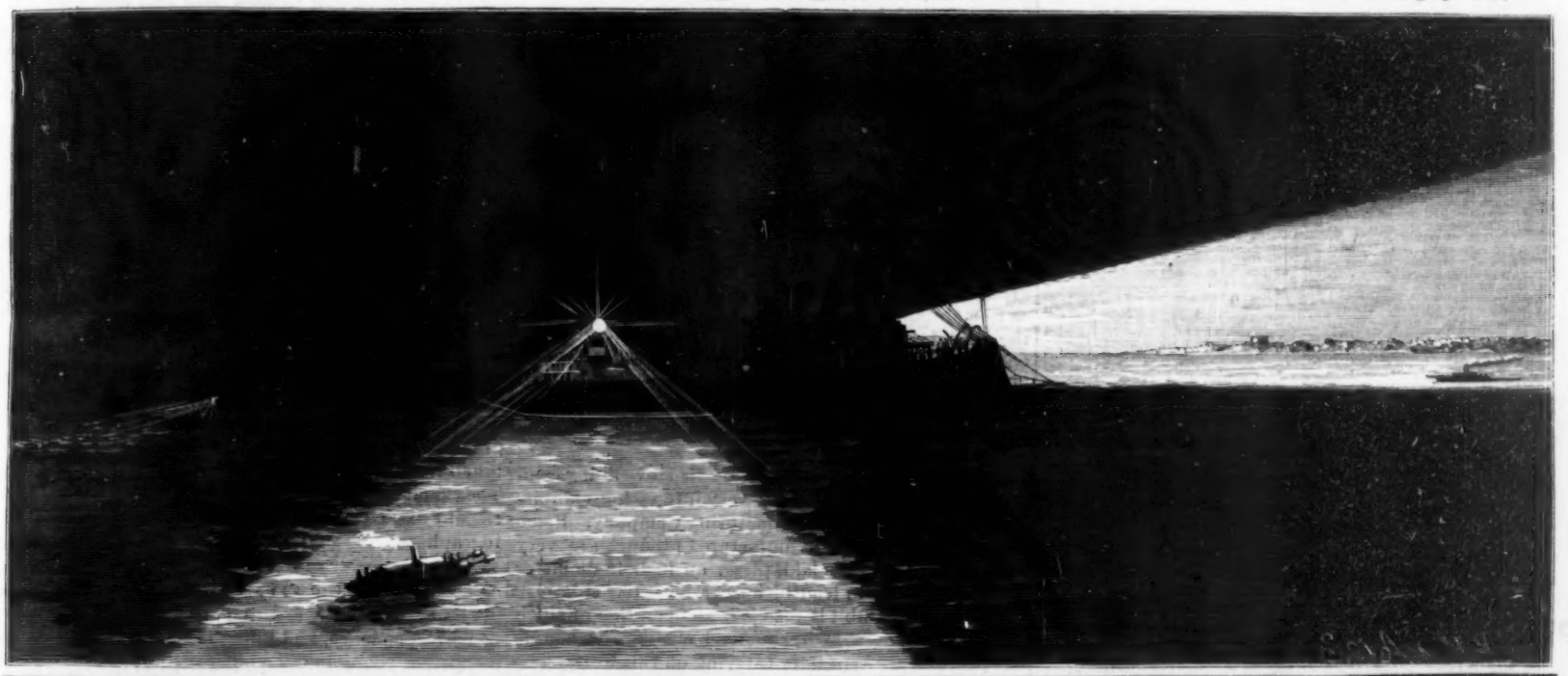

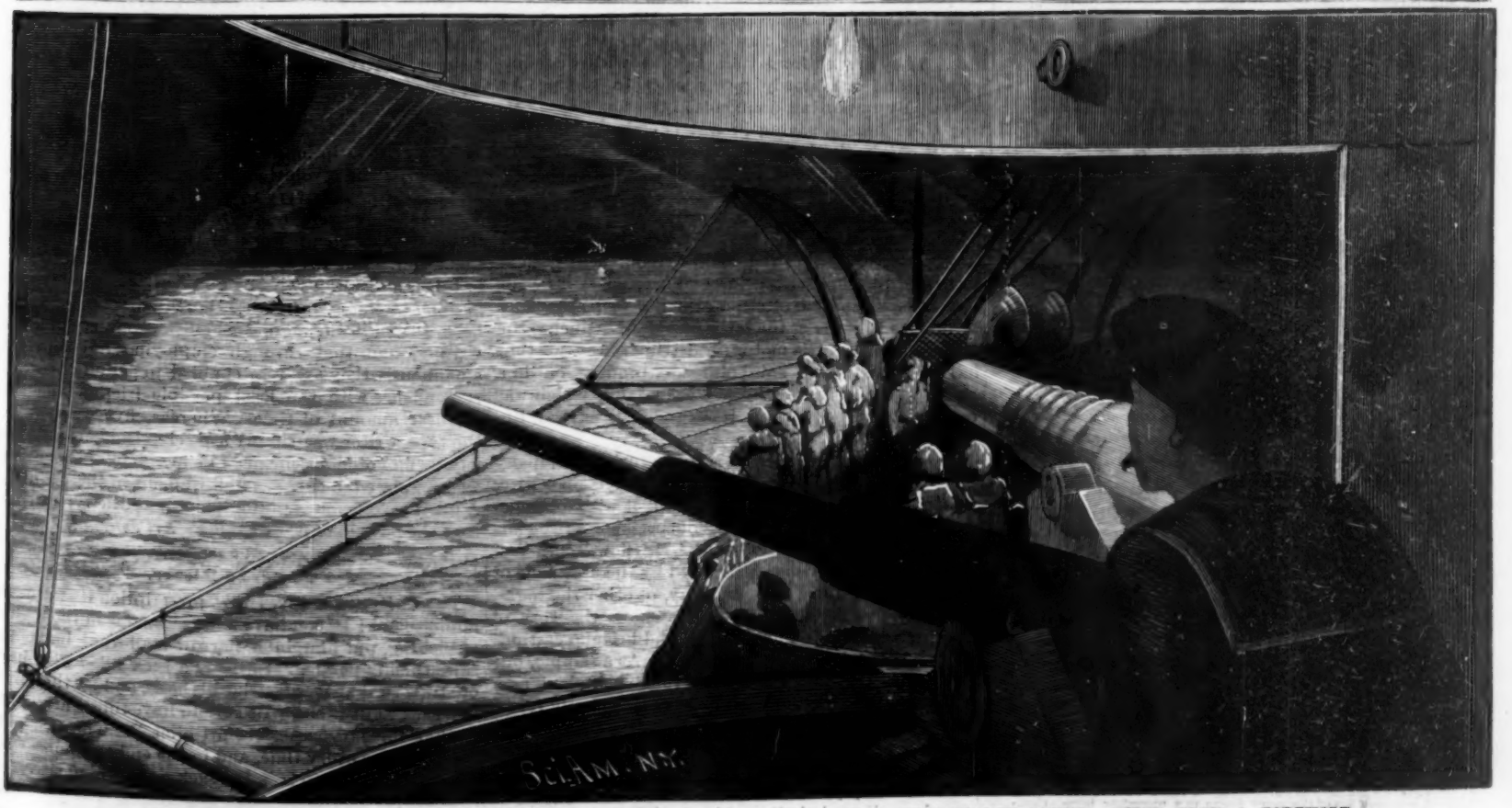

A SHAM BATTLE AT NEWPORT—THE ATLANTA PREPARED FOR ATTACK; USING THE SEARCH LIGHTS; VIEW FROM A PORTHOLE.

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 22, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 616,

For the Week Ending October 22, 1887.

Price 10 cents. For sale by all newsdealers.

NEW KNOWLEDGE ABOUT CAR COUPLERS.

The idea that it was necessary to have a certain amount of loose play between the cars composing a long train, in order to start the train easily, had become by practice and theory almost as fixed in the minds of railway people as is the geometrical axiom that two parallel lines can never meet. The theory was, by starting one car first, and so gaining a little inertia, then the next car, and so on, it was made possible for an engine to start and haul a long train of a given weight, when, if there were no play, the engine would be stalled and unable to start the train.

But the fallacy of the practice and the theory was conclusively established during the remarkable series of car coupler experments made by the Master Car Builders' Association, at Burlington, Iowa, this year. During these trials it was demonstrated beyond all question that it required less power to start a train with all the couplings tight than to pull the train after the train was put in motion; and the Coupler Committee came to the conclusion that the coupler of the future ought to be an approved form of the close hook style.

THE AMERICAN INSTITUTE EXHIBITION.

The 56th exhibition of the American Institute is now in progress at the Institute building on Third Avenue, in this city. As yet all the exhibits are not in place and in running order, but a few days will have everything in full operation. So much of interest is to be seen and studied there that a single visit is far from enough to do the Institute justice. The recent development of the economic applications of electricity have had their effect in founding what is a comparitively new division of the exhibition. Some of the most interesting exhibits are in this class.

The Draper Mfg. Co. exhibits a series of registering meteorological instruments. They include a thermometer, barometer, anemometer, pluviometer, sun thermometer, and wind gauge. The last named registers the force of the wind in pounds per square foot. One peculiarity of these instruments is the use of flat registering tablets instead of cylinders. Thus the record of the entire period of registration is visible at a glance. A glass tube drawn out to a fine orifice and charged with red ink is used instead of a pencil to mark the line upon the registers, thus avoiding friction.

The Bentz thermo-electric regulator is a practical application of somewhat the same character. The draught of a furnace is regulated thermometrically so as to maintain the temperature of a room always at the same degree. In kerosene fire logs and cartridges one of the recent tendencies of invention, also in the line of domestic heating, is well illustrated. The idea is a good one, and it is hoped will put an end to the deaths resulting from attempts to light a fire by kerosene poured on indiscriminately.

Asbestos packing, cloth, and plastic stove lining composition are represented by very interesting exhibits of the H. W. Johns Manufacturing Company. Some of the samples of the manufactured product are very beautiful. One rope-laid piece, an inch in diameter and many yards in length, looks almost like silk.

Before this exhibit is reached, an operation of much interest may be seen in diamond cutting. A couple of operators are kept busy carrying on this work. The stones bedded in composition are held in supports bearing against the upper face of a horizontal rotating disk. They are fed from time to time with diamond powder, and are slowly worn away to the proper facets. By importing diamonds in the rough and cutting them here, a saving in cost is claimed. At any rate, it marks the introduction of a new industry, as but a few years have elapsed since the first stone was cut in America.

Leather link belting is well exhibited in a series of belts of different widths, that are kept in motion over two cylinders. One of the main driving belts used in actuating the countershafting and machinery is of this type also. A special interest attaches to leather link belting, as it is one of the few methods of reducing the velocity of an electric motor for driving street cars that has ever succeeded. This point was brought out in a recent paper by Mr. Anthony Reckenzaun, which was read before the American Institute of Electrical Engineers.

The Washburn & Moen Manufacturing Company have a large case containing samples of copper wire, watch and other springs, a copper ingot with polished face, and wire cables. A series of specimens of the latter show the rigging used on the Mayflower and Volunteer, each rope being designated by the use made of it, whether for head stay, bob stay, or other rigging.

One interesting series of exhibits shows the work of the Shriver Iron Foundry. Relief and intaglio castings of great delicacy are comprised in it. As a sample, one casting is made from a piece of rough ash plank as a model. All the grain of the plank is perfectly reproduced in the cast iron.

In the rear extension is one of the cyclone pulverizers, which of late have attracted some attention by their extraordinary power of demolishing and reducing to powder nails and similar objects. When set to work, it will doubtless attract much attention. In the same part of the building a series of rock crushers are kept working, producing broken stone for road making, concrete, and other uses. Here also are some of the St. Lawrence River fishing boats, fitted with centerboard and sail, as well as for oars. They have nickel plated fittings, cane seated chairs, and are very elegantly finished.

The electric exhibition includes far more of interest than our space will enable us to describe. The Sprague motor and the Daft motor are shown driving various classes of machinery, such as printing presses, fan blowers, elevators, etc. A sectional piece of the Daft electric way with central underground wire, and an electric railway running the length of the building and driven by the Daft motor Ampere, are of special interest. A Sturtevant fan is shown directly driven by a Sprague motor; the armature is carried by an extension of the axle of the fan.

Two of Prof. Forbes' electric meters are shown, one inclosed in a glass shade, the other in a cylindrical metal case with plate glass top. The meter was recently illustrated by us.*

Queen & Co. have a very full series of electrical apparatus: Solenoid am and volt meters; Wheatstone bridges on the meter bridge principle, but of contracted length; Ayrton & Perry and Deprez & Carpentier volt and am meters; pocket galvanometers and general electrical instruments of precision of endless variety are included, and would repay a long inspection.

The Thompson process of electric welding is to be performed practically in a few days. At present a remarkable series of samples of the work is shown. It includes bars of cast and wrought iron, steel, zinc, lead, brass, and copper all thus united. Many broken pieces are shown, the break never occurring at the weld. Twist drills welded in the twist, a drawing knife the weld in which cannot be seen, lead and iron pipe and other difficult objects electrically welded are among them. This process should be seen by all, as it is one of the most interesting electrical developments of the day. It is of theoretical interest as establishing the existence of a zone of welding or of plasticity for all metals so far tried. For flux, borax is used with the hard metals, and soldering acid with soft lead and zinc.

In the Edison exhibit as yet little is to be seen. The dynamo is elegantly finished, and is well worthy a careful inspection. The "straight line" engine by which the dynamo is driven is of interest. Cylinder, front cylinder head, and main frame are all in one casting. No packing is used. The joints of the back cylinder head and steam chest are faced, and are made iron to iron. The piston rod runs through a long sleeve of Babbit metal. This is drilled to fit it tightly when cold. The heat of the steam makes it a perfect fit.

A great number of prints executed by the photogramme process are shown. Among them is a series taken from orthochromatic negatives of oil paintings. These mark an important technical application of this elegant discovery, and should be examined by all photographers.

What the Type Writer is Doing.

The type writer is creating a revolution in methods of correspondence, and filling the country with active, competent young ladies who are establishing a distinct profession, and bringing into our business offices, lawyers' offices, editorial sanctums, etc., an element of decency, purity, and method which is working a perceptible change. The field is widening daily; not from crowding out of their places young men who have been in the habit of claiming a pre-emption for clerical work of all descriptions, but in creating absolutely new positions. The revolution, if it may be called so, has come from the discovery to business men of an ability of which they were unaware until the great convenience and excellent work of the type writer forced them to it. The art of dictation is almost a new art, but it is spreading rapidly, and business men are beginning to understand that much of their lives has been wasted in the mere mechanical drudgery of letter writing, and that through employing a competent amanuensis they are now enabled to get off their correspondence with the least possible friction and the smallest amount of time. Whereas, five years ago, the type writer was simply a mechanical curiosity, today its monotonous click can be heard in almost every well-regulated business establishment in the country. A great revolution is taking place, and the type writer is at the bottom of it.—*Penman's Art Journal.*

To Cure a Kicker.

The *Calistogian* gives this prescription its warmest indorsement: If you have a horse that is in the habit of kicking, put him in a narrow stall that has both sides thickly padded. Suspend a sack filled with hay or straw so that it will strike his heels, and let the horse and sack fight it out. Be sure to have things arranged so that the horse cannot hurt himself. The sack will be victorious every time, and in the end the horse will absolutely refuse to kick the sack or anything else.

* See SCIENTIFIC AMERICAN for October 8, 1887, page 223.

PHOTOGRAPHIC NOTES.

Enameling Prints.—From the *Photographic News* we take the following interesting details as presented at the May meeting of the French Photographic Society:

It has been recommended to dry these images upon a sheet of ebonite or of glass, polished and rubbed with talc. The enameled image takes the polish of its support; but this polish covers the whole paper, the image as well as the margin, supposing that we have, with the help of a mask, obtained a white margin. In place of employing a glass polished on its entire surface, we use plates having ground surface round the edges in such a way that the central part, corresponding to the surface of the image, is left bright. It results, from this arrangement, that if an image on gelatine paper is dried upon this glass, and care is taken to make the polished space coincide with the image, we shall have after desiccation a sheet of paper presenting two different aspects. The image only will be enameled, while the margins will be mat. If, in place of limiting ourselves to margins evenly mat, we grind upon the glass a pattern to serve as framing, the pattern thus engraved will be reproduced upon the white margin, and the print is very well displayed, especially if the pattern is of elegant and graceful design. We may even obtain margins in intaglio or in relief by cutting the glass in such a way as to produce this effect.

In the latter case, we cannot content ourselves by simply laying the print upon the talcked glass, the film of gelatine upon the paper not being thick enough to fit into the hollows. We must in this case supplement the paper by the preliminary employment of a sheet of gelatine which has been thoroughly swelled with water, and which is applied to the engraved glass. This sheet, thoroughly softened by soaking in water, takes into the depressions of the glass. The proof may be laid in its place as soon as the sheet of gelatine adheres sufficiently to the surface of the glass. The whole is left to dry in a place free from currents of air, and when it is dry, the proof, which makes one body with the gelatine, is found to have its framework in hollow and relief, according to the form of the support employed. If we have recourse to the process of pigment printing, it is easy to produce variations having charming effect. We may, for instance, transfer upon the polished center of the engraved glass a print developed upon flexible support. If it is desired that the image be colored, the color must be applied upon the image after it has been transferred to the glass. The whole is then coated with plain collodion.

The manner of drying enameled images has much to do with the success of the operations which have just been described. If the process of drying is too rapid, the paper becomes spontaneously detached at the edges, while the central portion of the proof still adheres to the glass. This causes deformations, which may be avoided by covering the back of the image and the whole surface of the glass with a sheet of ordinary paper previously wetted. This paper must be larger than the glass, so that its edges may be brought round to the other side of the glass, and there cemented to it. In drying, the paper contracts strongly, and thus keeps the proof flat against the engraved glass. Thanks to this little contrivance, the accident of curling away from the glass is no longer to be feared. It is not necessary to say that such means cannot be employed on sheets of gelatine not backed up with paper. We must then limit ourselves to keeping the edges in place by the help of a border of albumenized or gummed paper applied as a binding round the edge of the plate. Perhaps there may seem to be too many details for such a small matter, but when operative applications are in question we know that we ought not to omit useful details, as by including them persons desirous of repeating our experiments will succeed with greater certainty.

One last word is necessary to finish this subject. It relates to prints not incorporated in gelatine, such as platinotypes and phototypes. To enamel prints of these kinds we must in the first instance gelatinize them with a solution of gelatine in water at five per cent. Afterward the print is treated in the manner which has been described for prints upon Eastman paper and the like.

Stripping American Bromide Films.—By J. M. Turnbull.—Strippers, as they have been termed, have only been in the market for a few weeks as yet. They are composed of a thin film of soluble gelatine on the paper support, over which the harder emulsion is laid, and which will stand considerable heat without dissolving. When it is decided to strip a negative, I proceed in this way, which I think to be a decided improvement upon that given by the Eastman Company, because it is more simple and more expeditious, and at the same time giving equally perfect results. I found on experiment that there was no need to let the negative dry before stripping.

After exposure and development, lay the picture down on glass which has been previously coated with either thin rubber or collodion—I prefer collodion. This should be done in a flat dish of water. When both are in contact, lift out and squeegee down. After two or three minutes put the plate into hot water, and the paper will begin at once to show signs of coming off. Pull it gently away with the finger, and you will find the negative now left upon the collodionized glass. A soluble gelatine will be found upon it, which is easily removed. Now, while the plate is still wet, lay down the skin upon it, which is to act as the final support of the negative; or, what comes to the same thing, coat it with stripping varnish, and set up to dry. I found the formula given with the films took a very long time to accomplish this—some six hours, and often more—and the cause seemed to me to be an excess of glycerine. I therefore have altered it considerably. I take:

Coignet's gelatine	8	ounces.
Glycerine	½	ounce.
Carbolic acid	¼	"
Water	30	ounces.
Methylated spirit	20	"

The gelatine is soaked in the 30 ounces of water, and, when soft, melted; the other ingredients being then added. This varnish will be found to dry rapidly, and renders the use of "gelatine skins" unnecessary.

Mr. Turnbull exhibited a negative prepared in this way, and stripped it by the aid of a knife, as in the former case. He remarked that development and stripping, when a few negatives are in question, may go on continuously till all are finished, the one becoming ready as the other is stripped.

The lightness and portability of these films, either for carrying in the field or transport otherwise, were remarked upon, and the advantages they offered in cases where reversed pictures were required. Mr. Turnbull also alluded to a handy means of leveling plates while coating, which he had published in the journals about 1874. It was to make use of Nettlefold's screws for picture frames by fixing them in a board at points forming a triangle, raising or lowering them as required till a perfect level is obtained. The plate being warmed, coating is then made easy and regular.—*Photo. News.*

Drinking before Meals.

An acquaintance of the writer who has suffered sorely from dyspepsia for a number of years, and has tried most of the numerous remedies a host of kind friends have recommended for her relief, hands us the following article from the *Medical News*, with the request that it be printed in the SCIENTIFIC AMERICAN. Our dyspeptic friend has found great relief in following the directions, and it is hoped others may be also benefited.

"In the morning the stomach contains a considerable quantity of mucus spread over and adherent to its walls. If food enters at this time, the tenacious mucus will interfere, to some extent, with the direct contact between the food and the stomach necessary to provoke the secretion of gastric juice. A glass of water, taken before breakfast, passes through the stomach into the small intestines in a continuous and uninterrupted flow. It partly distends the stomach, stretching, and to some extent obliterating, the rugæ; it thins and washes out most of the tenacious mucus; it increases the fullness of the capillaries of the stomach, directly if the water is warm, and indirectly in a reactionary way if it is cold; it causes peristalsis of the alimentary tract, wakes it up (so to speak), and gives it a morning exercise and washing. Care must be taken not to give cold water when the circulation, either local or general, is so feeble as to make reaction improbable. We should not risk it in advanced age, nor in the feeble, whether old or young, nor should it be given in local troubles, like chronic gastric catarrh. In these cases it is best to give warm or hot water. The addition of salt is very beneficial. Such a time-honored custom as drinking soup at the beginning of a meal could only have been so persistently adhered to because of it having been found by experience to be the most appropriate time. It does exactly what warm or hot water, with the addition of salt, does, and more, in that it is nutritive and excites the flow of gastric juice."

Dynamite in Shells.

Interesting experiments were made at Montpelier, Vt., Oct. 11, at the State Arsenal grounds, under the direction of Mr. B. D. Stevens, of Burlington, to illustrate the working of his new invention of a mode of packing dynamite so that it may be fired in an ordinary field piece with a gunpowder charge as the propelling force. An ordinary twelve pound Napoleon gun was used. Mr. Stevens took an ordinary twelve pound shell, and after extracting from it the usual charge of iron and explosives, packed in it one half pound of dynamite. Two and one half pounds of powder were used for the propelling force.

The invention consists of the composition of the explosives and the packing, and the character and arrangement of the springs or cushions used in the shell. The shells are exploded by means of an ordinary fuse, and cannot be burst. Five rounds were fired under the direction of Mr. Stevens. The first shell passed through a target made of two inch plank, and penetrated the ground a quarter of a mile beyond, where it exploded. The second shell struck a mound of earth, 20 feet in diameter, and passed through it into the air and exploded. The third and fourth shells struck a stone wall, and after demolishing it by the force of concussion, burst into fragments a little beyond. The fuse in the fifth shell was timed to one second, the result being that it burst in mid-air, without coming into contact with any obstacle.

Mr. Stevens formerly gave a test of his invention on the government testing grounds at Sandy Hook before an ordnance board of regular army officers appointed by Secretary Endicott, on which occasion he fired five shells out of a seven inch rifled gun, but further trials were suspended.

The Detroit Electric Street Railway.

"Do you make any speed with the electric motor?" a reporter of the Detroit *Free Press* asked of Frank H. Fisher, inventor of the system in use on the Highland Park road.

"Come out and receive a practical demonstration," was the reply.

The invitation was accepted, and shortly after the young inventor and reporter were at the power station. Here were found two dynamos, one for operating two cars, and a larger one for handling six. These dynamos are driven by one engine, and it was impossible to tell that the machines were delivering the current to the track, there being no spark and very little noise. The current is taken to the car by means of a third rail, which in the city limits is placed in a conduit entirely below the level of the street, but at the toll gate is raised somewhat and protected by wooden stringers on the remainder of the road. The equipment of the road has been increased, and the cars now run every half hour. While inspecting the conduit, the car Ampere came dashing down the track. It had hardly stopped when the crowd of waiting passengers began to scramble for seats. Mr. Fisher and the reporter took a position on the front platform. The conductor gave the customary yell of "All aboard," and then a signal to the motor man. The latter didn't yell "Git up," and pound a tired horse with a whip. He simply moved a little switch, and the car glided rapidly and noiselessly in the direction of Highland Park.

The trip to the end of the road, which is three and one-half miles, was made in fifteen minutes. On reaching the switch, the car Volta passed without any perceptible difference of speed in either car. This explodes the erroneous idea that two cars going in opposite directions and propelled by electric currents cannot pass each other. On the return trip, when the pretty stretch of road from the post office to Kaiser's was reached, Mr. Fisher gave a signal to the motor man, who moved another switch and "let her out." The car shot forward, and rushed past Highland Park and Captain Stevens' farm at a rate of twenty-five miles per hour. The speed was maintained until the switch was reached, when it slowed down to twelve miles an hour into the city.

The new cars Franklin and Faraday, recently placed on the new road, showed marked improvement in mechanical construction. The motors are placed on the front platform, entirely out of the way of passengers, and there is an entire absence of wires and other paraphernalia. Each car is provided with an ammeter, which indicates the amount of current being used by the motor. The cars themselves, which were built by the Pullman Company, of Detroit, are fine specimens of railway architecture.

Capture of a Boa in a Sewer.

Some sewer men met with a strange adventure while at work one night in one of the labyrinths of subterranean Paris. As they were busily engaged in cleaning out that part of the metropolitan *cloaca* which is under the Boulevard de la Villette, they suddenly heard a loud and prolonged sound of hissing, which some of them took to be the cries of a person in distress, who had, perhaps, fallen into the drain at one of the open points. Redonnet, the foreman of the gang, thought, however, that the strange noise was caused by evil doers, who were probably hiding in the sewers from the police. So he took up his shovel and marched boldly toward the spot whence the sounds proceeded. After having proceeded a considerable distance, he saw by the dim light of the sewer lamps an enormous boa constrictor coiled around one of the water ducts, with its head protruding toward him. Redonnet immediate stunned the reptile with a vigorous blow from his shovel, and, his workmen having come up, the whole party set to work until they battered the life out of the ill-fated and imprudent boa. The remains of the reptile were then carefully collected and borne in triumph to the surface of the earth, and then to the nearest police station, where, it appears, the boa was "wanted," as it had managed to escape from the menagerie of a wandering showman, who had been exhibiting his "fearful wild fowl" to the inhabitants of the municipal boroughs of La Villete and La Chapelle.—*N. Y. Times.*

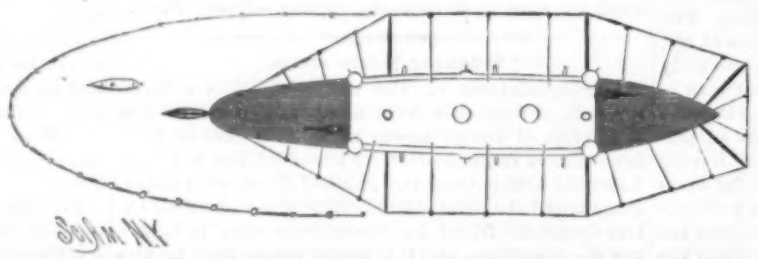
A TORPEDO BOAT FLOTILLA ATTACK THE ATLANTA.

(*Continued from first page.*)

covered, should approach the Atlanta to within twenty feet was to be considered as having successfully torpedoed her. If the Atlanta was torpedoed once, she was to be considered as disabled, and if torpedoed twice, as destroyed.

The night of the attack was a dark one, but the sea was smooth, although the tide ran pretty strong against the attacking boats, which were all numbered, provided with especial signals, and assigned distinct posts in the general plan of offensive operations. The defense was really only expecting an attack by the steam launches, but a large number of other boats participated. There were umpires on each boat, as well as on the Atlanta, to judge of the events connected with the engagement, and the attacking boats were to keep in ambush under the cover of neighboring islands, so that they might simultaneously approach the Atlanta, under cover of the darkness, from different points of the compass.

The preparations on board the cruiser for receiving the attack included the sending down of everything aloft except the lower yards, the rigging and gear being securely lashed, and the vessel looking almost dismantled, as is the characteristic appearance of modern war ships prepared for an engagement.* The captain of the Atlanta, in the afternoon preceding the engagement, moved his vessel further seaward, and took a new anchorage in the outer harbor of Newport, thus giving the cruiser a more effective position for defense, in a way that good judgment would indicate in a case of actual hostile attack. A stout five inch steel hawser was passed around the ship, just high enough above the water to prevent a hostile boat going over or under it, and this was guyed clear of the ship by the unrigged spars, the topsail yards being used to starboard and the topmasts to port. These were supported by tackles from the lower yardarms. Two spare booms were rigged forward twenty-four feet outward, and to these were attached a secondary steel hawser that encircled the ship from stem to stern. Upon the main hawser, at distances thirty feet apart, were suspended torpedoes, each controlled electrically, and so arranged as to fire on a closed circuit by contact, and with such a radius of fire that any boat striking the hawser was exposed to the destructive action of one or two torpedoes at a distance not exceeding fifteen feet. Towing astern was a whaleboat carrying a steam hose in such position that a stream of hot water could be directed against any approaching boat, there being another method of also employing this means of defense forward, and it being provided that an attacking boat was to be ruled out should it receive water from this hose during a quarter of a minute. Fifty yards astern of the ship a hawser was anchored carrying spare buoys and buoyed by empty water casks, with ropes, intended to entangle the screws of the attacking launches.



PROTECTING CABLES EXTENDED AROUND THE ATLANTA.

The principal defense of the Atlanta, however, consisted in her search lights and the ready means of training her guns in any direction which might be necessary. The two lights were mounted, one aft on the starboard and one forward on the port side, and their twenty-four inch lenses were so arranged that the sixteen thousand candle power developed was flashed out in any direction desired, close to the water, and with a range of over fifteen hundred yards. The vessel itself appeared to be in total darkness, but the brilliant rays of light sent far out over the water all around it by these lights, as they were thrown first in one direction and then another, presented a beautiful appearance, and quickly disclosed the approach of one after another of the attacking boats, long before they had come near enough to effect an attack. Simultaneously with this operation of the search lights, the gunners at their batteries, the trained men who handle the Gatling machine guns, and the sharpshooters, all indicated, by the prearranged signals, their readiness to engage the enemy whose approach the search lights had discovered. None of the numerous attacking boats came near enough to reach the outer hawser, or to receive hot water from the hose extended for and aft, and the defense of the Atlanta against this carefully arranged suppositious attack was unanimously pronounced by the judges to be perfect. How the affair might have turned out had the attack been made by real torpedo boats, which can make nearly half a mile a minute, is perhaps quite a different matter, but great credit is certainly due to Admiral Luce and the officers associated with him, for the lesson afforded by such a trial cannot fail to be of substantial value to the service.

THE art of paper making has reached a point where a tree may be cut down, made into paper, and turned out as a newspaper, in thirty-six hours.

*SCIENTIFIC AMERICAN SUPPLEMENT, No. 502, contains illustrations of British naval evolutions, including a night attack and system of defense against torpedo boat assaults.

A Sham Battle of Sailors and Marines near Newport.

In the further carrying out of the plans of Admiral Luce, of the North Atlantic Squadron, and the officers connected with him, to promote efficiency in drill and the use of modern machine guns and improved appliances, a mimic battle was arranged and carried out, on Coaster's Harbor Island, near Newport, on October 13. The scene of the battle was where the British troops were stationed for nearly two years during the Revolutionary war, and a defense and attack were organized, after a regular plan, with as much care and thought as would have been the case if a real battle had been imminent. All the peculiarities of the harbor were studied in arranging to have the attacking parties supported as well as possible by the ships of the squadron, while the garrison defending the post took advantage of a naturally good defensible position to make a creditable defense, until they were outflanked and compelled to retreat. The attack was made about half past twelve at night, on a signal from the flagship, when a flotilla of boats carrying about six hundred men made a landing on the north end of the island, under a supposed fire from a battery on a distant hill. As the boats touched, the men jumped into the water and hastened forward to throw out skirmishers, the pioneers cutting embrasures through the banks for the Gatling guns.

The enemy defending the island, composed of 250 blue jackets, occupied an irregular line of heights running across the island, forming a strong defensive position. There was a prolonged and spirited engagement, in which the different lines of attack and defense, on the right, left, and center, were successively the object of most particular interest, each side using their machine guns and small field pieces with great effect; and various features of the position, such as an old quarry, orchard walls, bluffs, and gulleys, were taken advantage of to aid first one side and then the other. The attack was a success, the whole affair being decided upon according to stipulations and plans previously agreed to by the umpires, and the battle afforded an excellent study of the practical work of war on a historic spot. This is only a portion of the work of the war college established by Admiral Luce at Newport, which has already been of great advantage to both the officers and men of the navy.

Charles L. Tiffany.

The fiftieth anniversary of the establishment of the jewelry house of Tiffany & Co., of New York, was celebrated in a very pleasant way by the employes and directors of the company of which Mr. Tiffany is the head. Wednesday morning, September 21, when Mr. Tiffany drove up to his establishment, he inquired why the big flag was floating from the building, having forgotten the fact that it was the anniversary of the beginning of his business. When he opened the desk in his office, there was revealed a beautiful rosewood box, two feet long by seven inches wide, on the lid of which was a tablet of pure gold, with "Chas. L. Tiffany, 1837–1887," engraved upon it. A key of gold rested in the Bramah lock, and when Mr. Tiffany opened the casket, he found on a bed of ruby velvet a vellum manuscript rolled on a magnificent ivory scroll. On the parchment was the following address of congratulation, each letter of which was beautifully illuminated in gold and colors:

"UNION SQUARE, NEW YORK, Sept. 21, 1887.

"MR. CHARLES L. TIFFANY:

"*Dear Sir:* On this, the fiftieth anniversary of the house of Tiffany & Co., we offer to you our congratulations on your unprecedented success, and that of the business founded by you, which, from an humble beginning, has, through your integrity, sagacity, and energy, arrived at the position of being not alone the first of its kind in America, but also the representative house of its business in the world. To our congratulations we add our hearty good wishes for the continuance of your health and prosperity, and that you may live long to enjoy the fruits of your labors."

This address was followed by the signatures of 1,110 employes of the firm, several of whom have been over forty years in Mr. Tiffany's employ.

Mr. Tiffany is a very quiet, unassuming man, and those who knew him best planned the presentation of this testimonial in such a manner as to spare him the embarrassment of a speech. The elegant and unexpected offering, and the way in which it was presented, touched him deeply. Mr. Tiffany has always proved himself a model employer, and is heartily liked by his subordinates. He has always attended personally to the business of the firm, and still continues to do so, being perfectly hale and hearty, although he is well on in the seventies.

Thousands of Mr. Tiffany's customers throughout the country will join the *Journal* in wishing him many happy, prosperous years in which to continue at the head of the great business which he has built up.—*Jewelers' Journal.*

Liquid Fuel.

About eighteen months since, we noticed the liquid fuel system of Mr. Edwin Henwood, of 22 Great St. Helen's, London, as applied to a screw steamer, the Ryde, of 120 tons burden. Mr. Henwood has now fitted a steam launch, the Ruby, with his apparatus, and we recently made a short run in her. The Ruby is 38 feet long by 7 feet beam and 3 feet 10 inches deep, and has a direct acting vertical engine, with a seven inch cylinder and an eight inch stroke. The boiler is of the return multitubular type, and the boat is driven by a three bladed delta metal screw propeller, 2 feet 8 inches diameter and 4 feet pitch. The fire bars have been removed, and replaced by Mr. Henwood's firebrick lining. Petroleum is supplied to a nozzle by gravitation from a tank over the boiler, and is injected into the furnace by means of steam taken from the boiler. The furnace is primarily started with coal until a sufficient steam pressure has been reached in the boiler to start the oil-burning apparatus. Upon the occasion of our run, steam was well maintained, and good speeds obtained. The results of some comparative trials previously made by Mr. Henwood with coal and liquid fuel in this boat show a great economy in favor of the hydrocarbons.—*Iron.*

Utilization of Fire Damp.

It is very interesting to see fire damp, the most dreaded enemy of miners, reduced by the genius of man to be his agent and servant, as has been done in Germany recently. The Wurm coal mines, near Aix-la-Chapelle, are particularly noted for the amount of fire damp produced in them, and the minutest precautions had to be taken to prevent dangers that, notwithstanding this, were to be feared. Mr. Hilt, director of the mines, undertook the work. He constructed a line of piping that ran in front of all the centers of work and ended in a main pipe connected at the surface with a powerful suction pump.

But it was not enough to get rid of the noxious gas with money—it was necessary to utilize it; and so Mr. Hilt conceived the ingenious idea of causing the conduit to end in a gasometer. Upon isolating the latter, and placing wire gauzes here and there in the conduit, he was enabled to lead the gas to the furnace of two generators and use it to help heat them.

We are obtaining, says the director, 30,500 cubic feet of fire damp, which distill 263 cubic feet of water. On uniting the fire damp of all our exploitations, we shall have 64 cubic feet per minute, and shall be able to distill 5,260 cubic feet of water per twenty-four hours.

The utilization of fire damp thus stored may become advantageous from a commercial point of view. It may serve not only for gas motors, but also, with well constructed burners, for lighting purposes.—*La Nature.*

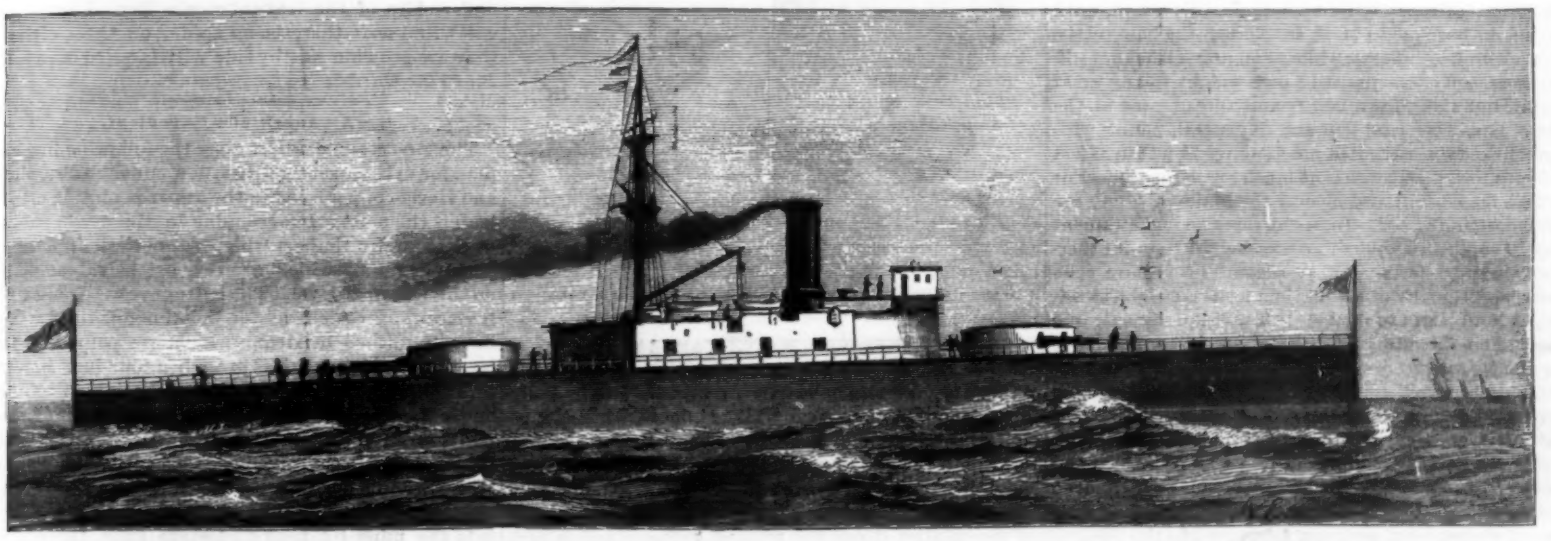
How to be a "Nobody."

It is easy to be nobody, and the *Watchman* tells how to do it. Go to the drinking saloon to spend your leisure time. You need not drink much now, just a little beer or some other drink. In the meantime, play dominoes, checkers, or something else to kill time, so that you will be sure not to read any useful books. If you read anything, let it be the dime novel of the day. Thus go on keeping your stomach full and your head empty, and yourself playing time-killing games, and in a few years you will be a first-class nobody, unless you should turn out a drunkard or a professional gambler, either of which is worse than nobody. There are any number of young men hanging about saloons just ready to graduate and be nobodies.

DEFINITENESS IN KNOWLEDGE.—The memory will only be content when there is that accuracy which gives absolute confidence. Suspicion of inaccuracy is the most vicious element in memory. It is more satisfactory not to recall a thing than to recall it in such a way as not to know what we have recalled—whether the recollection is reliable, where the memory of fact shades into fancy. It requires the best mental activity, the closest observation, the clearest thought, the sharpest discrimination, the cleanest classification, to give knowledge that definiteness which is indispensable to reliability in memory and accuracy in recollection.—*Journal of Education.*

H. M. S. TRAFALGAR.

This great turret ship, whose construction was begun at Portsmouth as recently as January, 1886, was launched September 20. She takes rank as the largest armorclad yet constructed for the British navy, her displacement when she is fully ready for sea amounting to nearly 12,000 tons, or rather more than that of the Inflexible. Her horse power is 50 per cent greater, and consequently her anticipated speed, 16½ against 14 of the older vessel. The Inflexible is 320 feet in length, 76 feet in breadth, her hull is built of iron, and her cost, completely armed, 810,000*l*. The Trafalgar is 345 feet in length, 73 feet in breadth, her hull is built of steel, and she will cost 920,000*l*. How one regrets the old days of "wooden walls," when such a sum would have sufficed for the construction of a whole fleet, instead of being sunk in a single ship! Launching and being ready for commission are two very different things. The Trafalgar will not be fit for sea, that is, with guns, stores, and crew all on board, till some time during 1890. Her armor alone weighs 4,230 tons, and very little of that is at present on her. Her principal armament will consist of four steel breech loading 67 ton guns, two being in each turret. These guns will be worked by hydraulic power. Besides these she carries in the box battery eight five inch breech loading guns. Of quick firing artillery there will be eight six pounder Hotchkiss guns and eleven three pounders. She will also be provided with torpedo tubes, and has a cast steel ram on her stem. Among other arrangements tending to the security of the ship, the Trafalgar is provided with an extraordinary number of water tight compartments. Her hull is sectionalized by twenty-seven bulkheads, rising through the several decks, and the decks themselves serve to multiply the number of compartments, so as to give the ship the greatest power of flotation when damaged below the water line, whether by shot, torpedo, or ram.—*London Graphic.*



H. M. S. TRAFALGAR, THE LARGEST IRONCLAD IN THE BRITISH NAVY, LAUNCHED AT PORTSMOUTH SEPTEMBER 20.

Carrier Pigeon Service.

Steps have been taken in nearly all European countries to establish military communication by means of carrier pigeons in time of war. England, France, Germany, Belgium, and Italy have definitely organized military carrier pigeon services, and some have subsidized the private training establishments, with the right to use the pigeons in war.

This method of communicating originated in China, or, at least, in the East, and it was most likely in use by the ancient Arabians. William of Orange and Napoleon I. used these messengers during their wars; but the greatest service was that rendered in 1870 between Paris and Tours.

During the siege of Paris, 150,000 official dispatches and about one million private communications, representing a money value of about $38,000, were conveyed by these pigeons. In this case the messages were reduced by microscopic photography, so that a tiny piece of silk paper, 1¾ inches long by 1¼ inches wide, could contain 3,500 messages of 20 words each, or 70,000 words. The total dispatch thus arranged weighed at most less than one-quarter of an ounce, and was secured by a light thread to the tail feathers of the pigeon. Upon arrival the dispatch was removed, enlarged by photography, and deciphered.

A large percentage of the birds are lost either through birds of prey or other misfortune, and it is necessary to send many duplicates to insure delivery of a dispatch. In one case 80 per cent of birds were lost in a short period, as Wurzburg, where 3,000 birds were sent out and only 600 were recovered.

The greatest attention to training carrier pigeons is paid in Belgium, and that government subsidizes this industry most liberally, in order to utilize the private establishments in case of war. The English government has done likewise. In Germany the war department possesses 6,000 carrier pigeons, and has the right to use 100,000 birds belonging to the carrier pigeon postal society. A law was passed in France, July 15, 1885, stipulating the enrollment of all private carrier pigeon training establishments, to be available in case of war.

The results of observations have caused a great deal of misconception about the nature of these birds. The best known ornithologists and carrier pigeon trainers hold contrary views and indulge in heated controversies.

It is, however, well established that carrier pigeons, like all high-flying birds, have keen eyes and also possess instinctive sense of direction, but many agree that they have a peculiar feeling, or exercise reason to a certain extent.

An Italian engineer states that in order to see a distance of 165 to 186 miles between two points on the earth's surface, it will be necessary to ascend to a height of 6,000 meters (19,680 feet); but whereas this distance is frequently covered, yet, if a pigeon is sent to a height of 4,000 meters (13,120 feet), it would lose its power to fly and drop lifeless to the earth.

The fundamental theory of the flight of these birds is not yet established, and it will be no easy task to ascertain the true scientific conditions. Ordinarily, the birds are carried in a closed vessel to the place whence they are to fly back home, and the whole secret of carrier pigeon service depends upon the attachment of the pigeon for its home, no matter how distant that may be. They do not always find their homes, but always endeavor to do so, and it has happened that birds have returned to their home roost after an absence of years. The birds are first trained for short flights, and then to take longer distances, in order to train them both to fly and to learn how to find their way home. In flying, the bird is indefatigable, and travels both day and night, without ceasing, unless overcome by hunger. The speed of an average pigeon is estimated at about one thousand yards per minute.

Certain reports from Italy state that especial attention is paid to training carrier pigeons in Parma, Modena, Reggio, and other places where there are carrier pigeon societies. The military carrier pigeon stations are most efficiently arranged, 'though they have only been introduced in Italy for military purposes during the last ten years. The first Italian military carrier pigeon station was established at Ancona in 1876, which was followed by that at Bologna in 1879. During the grand field maneuvers of the Italian army in 1882, this service was carried on so successfully that twelve military carrier pigeon stations were established, to embrace all parts of the kingdom. A correspondence was carried on between Italian army detachments at Umbria and Bologna, separated by an air line distance of about 135 miles. Forty-two carrier pigeons were sent, all but three of which returned in the following times:

12	pigeons	returned	in	3	hours	and	12	minutes;	rate	42	miles	per hour
10	"	"	"	3	"	"	37	"	"	34½	"	"
14	"	"	"	3	"	"	37	"	"	27½	"	"
2	"	"	"	5	"	"	18	"	"	25½	"	"
1	"	"	"	7	"	"	45	"	"	17	"	"

3 of the pigeons failed to return.

In the table the time given is the average for each group of pigeons; the greatest speed was attained by one of the first 12, which returned in 2 hours and 55 minutes, or at the rate of 46⅓ miles per hour.

The most remarkable of recent experiments was made in 1885, between the city of Rome and Maddalena Island, a distance of 178 miles in an air line, 149 miles of which were across the sea. The birds were carefully trained, in stormy and fair weather, to carry messages across the sea, and some of them performed the journey at the rate of 45 miles per hour. Two-thirds of the birds sent from Maddalena arrived at Rome in times varying from 4 hours and 50 minutes to 8 hours and 18 minutes; and the first arrival reached Rome before the cablegram announcing their flight from Maddalena Island. Only two-fifths of those sent from Rome reached Maddalena Island, which was doubtless owing to insufficient training.

Experiments with sea voyages for carrier pigeon services have also been made at the Cagliari naval station, which was established to reconnoiter the seas. Birds have covered the distance to Naples, 280 miles, in 9 hours. The longest voyage made in Italy was from Turin to Ancona, 310 miles, which the pigeons performed in the rain in 10 hours and 3 minutes. These experiments and strategical considerations have led to adoption of a limit of about 155 miles as the maximum distance between Italian military carrier pigeon stations.

A most interesting experiment was made by Mr. J. Wagner, of Boston, Mass., who sent 9 carrier pigeons to London by mail steamer on October 9, 1886. Shortly after their arrival they commenced their long flight home across the Atlantic Ocean. Up to January 10, 1887, three of these birds had returned; one arrived in Boston direct from London, the second was recovered near New York City, and the third was found in the Allegheny Mountains in Pennsylvania. The owner's address was painted on the birds' wings, and when they were found, the birds were returned to the owner. The other six birds were not recovered.

All kinds of experiments have been made to ascertain to what extent correspondence can be carried during rain, fog, snow, contrary winds, and in storms, and then to ascertain how the pigeons would cross ranges of mountains, especially the Alps, all of which have resulted satisfactorily. If the earth is covered with snow the pigeons will only make short flights, and in stormy weather they will stop on their journey until the weather moderates.

In cold climates only short journeys can be performed in winter, in which season it will be also necessary to provide stopping places or relays, even in southern stations.

The latest experiments in training pigeons have resulted in making the pigeons both go and return. This feat has been successfully accomplished in Germany and France.

In case of necessity the pigeons can be domiciled at a station in about twelve days, at the expiration of which period they will be available for messenger service.

The value of carrier pigeon service, in case of war, is being more and more appreciated, especially as the cost of the service is so small, and further developments may be confidently expected.

The successful flights across the seas render the use of carrier pigeons to convey messages from ships in distress to life saving stations, or to ports from whence assistance may be sent, extremely probable in the near future.—*Public Service Review.*

Effect of Electric Light on Books.

The *Revue International de l'Electricite* observes that Professor Wiesner, of Vienna, has drawn attention to the discoloration of books in the Technical School library, due to the use of the electric light. A large number of the works have become very yellow, and the director of the school requested Professor Wiesner to ascertain the cause. Experiment has shown that the discoloration is due to the action of light upon the paper containing ligneous substances, such as wood, straw, and jute. When the lignine is removed by chemical means, the effect is not produced. The yellowing is said to be due to a phenomenon of oxidation. Ordinary dispersed daylight exerts very slight action, especially in a dry room. On the other hand, the arc electric light and all intense, luminous sources emit numerous refrangible rays, and these favor the yellowing. The same process of yellowing we know takes place when papers bleached with certain substances are exposed to strong sunlight.

Slopes for Cuttings and Embankments.*

In rock cuttings, many instances may be adduced of the sides of excavations differing very slightly from the perpendicular, while the corresponding embankment may have slopes of about ¾ horizontal to 1 vertical. Excavations in chalk are commonly made (when the chalk is solid) with slopes varying from ¼ to 1 to ½ to 1, the slope being increased when the material is loose. Embankments in chalk may have slopes from 1 to 1 to 1½ to 1. Excavations in gravel will stand sometimes at a slope of ½ to 1, but more frequently at 1 to 1. Excavations and embankments in strong sand will stand at inclinations rather greater than in gravel. Embankments of gravel, if good, will stand well at 1¼ or 1½ to 1.

Very few clays can be trusted, either in excavation or embankment, at a less slope than 2 to 1. Both quicksand and peat require the aid of draining before excavation is practicable, and the great quantity of earth which they invariably swallow up renders the formation of an embankment upon either a work of great difficulty, unless the surface to be covered is previously prepared by means of fascines or hurdles to support the superincumbent mass. In materials of a rigid and unyielding character (such as rock and chalk), the practical limit to the depth of a cutting, or to the height of an embankment, goes far beyond that point at which a tunnel or viaduct would be more economical. In such materials, too, it does not become necessary to augment the inclination of the slopes with an increased height of embankment or depth of cutting, a step which is essential in soils of a yielding character, and becomes more necessary in proportion as the rigidity diminishes.

In yielding soils there is a limit of safety in the height of embankments and the depth of cuttings. The reason of this is obvious; the rigidity of an unyielding soil will admit of mass lying upon mass, like a wall, until the height becomes so great as to crush the base by the superincumbent weight; while a yielding soil has not sufficient tenacity to support its own weight to any great height, but sinks down bodily and spreads out at the sides. Gravel or sand will not, in general, permit with perfect safety a cutting of much above 70 feet to 80 feet in depth, or an embankment much exceeding 50 feet or 60 feet in height; and in clay the limits of safety are far more contracted. In some cases an embankment may be carried to a much greater height than it otherwise could, by forming it in several lifts above each other, and thereby allowing time for the weight to settle gradually, and to distribute itself equally over the base. The spreading of the foot of the embankment may be frequently prevented by cutting steps in a portion of the subsoil, and punning up a footing of some more rigid soil, in the form of a revetment. The consideration of the variable law which regulates the slopes required in yielding materials according to the depth of the cutting or the height of an embankment (increased height or depth requiring increased inclination of slopes) may, perhaps, fairly lead to the conclusion that where the height or depth is considerable the inclination of the slopes should not be in a regular, straight line, but rather in a curve, so as to have the greatest inclination at the bottom, where there is the greatest pressure, and the least at the top. This system would approach nearest to the analogy of nature, where rigid angular lines are found only in the unyielding rocky crags, while all the slopes of the more yielding soils are undulating.

Fire from Nitric Acid.

There was recently a prosecution before one of the Prussian courts of the agent (one Lack) of a banking house in Berlin, for jeopardy caused to a train of railroad cars. The main question was whether fuming nitric acid could, under the circumstances, occasion spontaneous ignition—which, after hearing the sworn testimony of the court's expert chemist, Dr. Jeserich, was decided in the affirmative. The agent had sent ten kilos (22 lb.) of fuming nitric acid from Berlin, intended for some point in Bavaria, per railroad. The acid was contained in a strong stone jar, tightly closed by a stone stopper and cement. The whole was packed in straw within a wooden case. Since such caustic and dangerous liquids would not be transported by railroad as express freight, the contents of the box were represented to be clothing, and by this means the concealed acid was sent by a passenger train. During the journey, and when near the station Butterfeld, the car containing the express freight was discovered to be on fire.

Before the flames had made serious progress, the car was uncoupled and switched off on a side track, and the fire extinguished with comparatively slight damage, and no person was injured. Examination showed that the jar had leaked, and the acid had come in contact with a roll of woolen cloth, whereby the latter was set on fire. Dr. Jeserich gave it as his opinion that all woolen goods, and all hair of animals, horn, etc., have the property of igniting spontaneously when coming in contact with fuming nitric acid; and he stated that all the new explosives, about which there has been so much said and written lately, such as roburite, melanite, etc., are due to the action of nitric acid on hair and wool. Herr Lack, the agent who made the misrepresentation about the acid, was condemned to two months' imprisonment.—*All. Vers. Presse, Berlin.*

* Sir C. H. Gregory, in London *Architect.*

A WATCH CAMERA.

Numerous ways have been invented to compress the essentials of a photographic apparatus into a compact space, that its true character may be concealed, but we call to mind none more effective for this purpose than the watch camera illustrated herewith, which comes to us as an English invention, made by William J. Lancaster, of Birmingham, England.

A substantial watch case, presumably about the size of the well-known American Waterbury watch, is provided with two hinged covers arranged to fly open in the usual way, one protecting the back and the other the front of the camera. The bellows of the camera may be made of rubber or in the form of a volute spring having flanges on the back of each convolution to make it light-tight when extended.

On the front is secured a suitable lens of the wide angle type. Arranged on the interior of the bellows is a cone-shaped spiral spring. On releasing the catch of the cover, the latter flies open, while the spring on the interior of the bellows at the same time extends it forward ready for use, as shown in Fig. 1. In the body of the watch are two spring-hinged doors, which act as shutters and are held closed by a small L shaped catch formed on the end of a short pin, which is operated by the fingers on the outside edge of the watch. The sensitive plate is held in a rectangular pocket just back of the shutter doors, by pivoted buttons, and is protected from light by the back cover. The plate is inserted and removed in a non-actinic light.

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IMPROVED WATCH CAMERA.

In operating the camera, supposing it to be filled and closed, as shown in Fig. 2, we simply hold the watch in a vertical plane with the front cover side toward the object and release the catch, which allows the bellows behind the cover to extend. When ready to capture the picture, the shutter catch is released, allowing the shutter doors, by means of a peculiar mechanism, to instantaneously open and close and thus make the exposure. By carrying a small thick cloth bag not much larger than a boy's marble bag, closed at the mouth by an elastic, it is possible to remove the exposed plate from the camera in daylight and insert a fresh one. After exposure the plate is developed in the usual way. It will be seen that only one picture can be made at a time, and some device for changing the plates is necessary to make the apparatus of value. The inventor states that the same principle of construction is applicable to other peculiar novel forms, such as cigarette cases, match boxes, purses, lockets, and charms.

By means of other special attachments, we see no reason why a genuine timepiece may not be combined with the photographic watch in such a way that a race horse can be instantly photographed at the same moment the stop movement of the watch is manipulated. Thus the time and picture of the horse can be recorded at the same instant. Cannot some ingenious American inventor perfect this idea?

Vaporizing Sulphur for Red Spider.

The vaporizing of sulphur for the destruction of red spider is largely practiced by one of the leading grape growers in the following manner for market. The pipes are thickly covered with pure sulphur, and are then heated to their highest possible capacity, the fires being hard driven all night. The house becomes so charged with sulphurous fumes that the attendant cannot remain in it for any length of time. This is repeated for three or four nights in succession. I may mention that this remedy is only employed when the spider attacks with such persistency that a jet of water thrown violently from the hose on the foliage has not the desired effect. The grower in question affirms that no harm ever comes of such a lavish use of sulphur, and I know that his houses of Alicantes are second to none in the country. This was confirmed by the attendant, who informed me that he has used in one season thirty-two pounds of sulphur for a house one hundred feet long. It is worthy of note that this individual is a grape grower by birth. He comes of a family which comprises seven well-known market growers. His father was one of the cleverest grape growers around London. So that we have the guarantee that this strong sulphur remedy is the result of careful observation extending probably over nearly half a century. Many of the operations of our best market growers are of a hole-and-corner description. Practiced by one or two individuals, they are jealously guarded, and it is only now and then that a ray of light is let in on them. The method of destroying red spider with sulphurous fumes lies in a nutshell. It is simply accurately gauging the amount of it that will be destructive to the insect while doing no harm to the vines. This knowledge will not be acquired by leaps. It is only to be done by a series of experiments, gradually increasing the amount of sulphur until the spider is killed. If this point is reached and no damage is done, the destruction of red spider becomes a very easy matter. Syringing with clean water for the destruction of red spider when once it has got firm hold is almost useless. But well washing the foliage in combination with plenty of root moisture and good food is a fine deterrent. I see this in the case of two small Alicante vines that were planted in a house containing Hamburgs, which, owing to scarcity of water, the roots being inside, are badly attacked. The two vines in question became infested, but wishing them to get established I kept them well watered, and syringed thoroughly the under sides of the leaves twice a day. I cured these vines, and now there is no spider on them, although they are growing side by side with infested ones.—*J. C. B., in the Garden.*

An Ingenious Expedient.

The *American Analyst* gives the following ingenious plan for extinguishing a fire in a mine. The Calumet and Hecla copper mine in the upper peninsula of Michigan is the most extensive mine in the world. Several weeks ago the timbers which support the pumps and "man engines," which are very extensive, caught fire on the 1,600 foot level. The entrances to the mine were hermetically sealed, and it was thought the fire could be extinguished by steam, which was poured into the level in great quantities through a four inch iron pipe extending five hundred feet into the mine. Prof. Alexander Agassiz, of Boston, president of the mining company, arrived on the scene a few days after the fire broke out. He conceived the idea of flooding the mine with carbonic acid gas. Chemicals were procured and the gas was manufactured in great quantities and forced into the mine by heavy pressure from the engines. The plan was entirely successful, and when the mine was opened a few days later, not a trace of fire remained. An engine was set to work pumping out the gas and another to forcing in fresh air, and it is expected that the air will be such as to permit work to be speedily resumed.

What a Patent Should Mean.

A correspondent expresses his views as follows: If a patent means anything, it should mean that after the applicant has in good faith paid the U. S. government the required sum for a patent, the supreme court of the nation, after due examination of all former patents, binds itself for a specified number of years to absolutely defend the inventor against all claims whatsoever of infringement upon former inventions or attempts at infringement upon his invention.

Yet, alas! such is not the case. And hence, thousands of useful inventions sink back into oblivion, through dread of expensive litigation after the expense of a patent.

The government is the proper authority to pass final decision, and, as it can bear the expense millions of times easier than the average individual, ought by all means to do so, that a patent once granted may, like a perfect warrantee deed, be absolute. If necessary, let the investigation fee be raised to $25 or $30, and the full cost of a sure patent to $100, and it certainly will be far better all around in the end. Inasmuch as a patent is not absolute, it is a sham, ay, base fraud.

S. L.

A Good Idea.

A writer in the New York *Tribune* recommends the appointment of an expert in all banks, who will be capable of taking the place and doing the work of any man in the concern, from the president down. He is to be empowered to say to the president or cashier, "I will go over your assets to-day," or send the teller or other employe on a short vacation at any time, while he takes his place. By this plan no one would dare abstract a dollar from the bank, as he could not tell at what moment the expert would examine his books and discover the shortage.

Correspondence.

The Defense of New York Harbor—A New Torpedo.

To the Editor of the Scientific American:

I have several times observed articles and communications in the SCIENTIFIC AMERICAN on the subject of the defense of New York harbor. The substance of what follows was addressed by me some six weeks since to the editor of a leading journal in a neighboring colony, but no notice has yet been taken of it. Perhaps the mechanical genius for which America is so famed may see something in the idea, and give it practical effect.

It has often occurred to me that a much more effective description of torpedo remains to be invented than any yet constructed, and that by applying the rocket principle of propulsion to a suitably shaped case or hull, to be driven on or beneath the surface of the water, the great object of attaining a high rate of speed for a long distance might be gained, while the torpedo might be rendered dirigible, so long as its course remained visible, by means of electric wires, which would be unreeled from the hull as it advanced, and by which its connection with the shore or ship from which it was launched would be maintained, so that a properly balanced steering apparatus could be instantaneously operated. A 32 pound war rocket has a range of upward of two miles, which is far greater than the run of any torpedo yet invented. And when we consider the enormous power which must be required to drive such a weight through the air, and overcome the attraction of gravitation for such a distance, it is evident that if the missile were supported on the surface of the water, the same power would suffice to impel it for a vastly greater distance, or would drive a much greater weight for the same distance, though with diminished velocity. If we place a heavy spar, which will just float, in the water and give it an impulse, it will advance for a considerable distance, while all the force that we could exert would not enable us to project it into the air or to push it along if resting on the ground.

The Whitehead or fish torpedo is limited in size and range. Its charge of damp gun cotton is about 70 lb., and the distance it can run is only some 600 yards. For this short range its speed is comparatively high, having been known to reach the rate of 26 knots an hour. But it has numerous drawbacks. Its mechanism is complicated, costly, and easily deranged. It must be charged with compressed air by an independent engine. The requisite pressure on its receiver reaches the enormous degree of from 1,000 to 1,200 lb. to the inch to give it only the short run previously spoken of. It is not dirigible, and frequently misses its mark in experimental trials, while its efficiency in actual warfare remains to be proved. Owing to the shortness of its range, it requires the aid of a very fast steam launch to bring it within striking distance of its object, while such launch in its approach and retreat has to run the chance of being riddled with the hail of iron which may be discharged against it by the rapid-firing guns with which men-of-war all over the world are now being provided. Even if the torpedo goes straight for its object, it may be stopped in its career by a netting, which (owing to its small size and want of sufficient momentum) it cannot penetrate; or, if it should reach the side of an ironclad and explode, its comparatively small charge might do very little damage, as recent experiments have shown.

On the other hand, a rocket torpedo might be constructed of any size desired, with a range of several miles and a speed of fifty miles an hour, or even more. The operator charged with its direction could be stationed at an elevation, so as to observe its course, and instantly change it when necessary. It could carry an explosive charge of any weight desired, sufficient to sink the most powerful ironclad yet built, even if exploded at the distance from her at which her netting might be suspended. But no netting that could be carried would be likely to resist the impact of a body weighing several tons, armed with a powerful steel head, and moving with a velocity of fifty or sixty miles an hour.

The Brennan torpedo possesses certain advantages over the Whitehead in having a longer run and being dirigible, while it may be constructed of such a size as to carry a very large explosive charge; but it has its drawbacks. It requires a powerful engine on land or on shipboard to haul in the wires which set in motion its propelling machinery; and its speed is very limited, being far less than that of the Whitehead torpedo. Its use is thus necessarily confined to cases where a winding engine can be placed on the spot from which it is started. The rocket torpedo would be free from such impediments to its general employment. It would be entirely self-contained. It would require no swift torpedo launch to rush with it into dangerous proximity to the large machine guns or rapid-firing weapons of an ironclad. It would not need any independent engine or any complicated mechanism within itself for propulsion. It would be propelled by the simple discharge of the immense volume of gas generated by the combustion of the rocket composition, acting on the recoil or reaction principle. It would be always ready for action. It could be conveyed by vehicle or boat to its position, and there operated by the single individual managing the electric steering apparatus, without any appreciable danger from exposure. Such a weapon, it seems to me, would be particularly suitable for the protection of ports, harbors, and seaside towns all the world over, and might, to a large extent, supersede the construction of gigantic cannons and huge fortifications, and the vast expense of erecting these and maintaining garrisons.

WILLIAM RITCHIE.

Launceston, Tasmania, August 29, 1887.

Petroleum in Italy.

To the Editor of the Scientific American:

On a visit I lately made to one of our most important watering places, called Salsomaggiore, a village at the foot of the Apennines, six miles east of Borgo San Domino, a railroad station on the main line to Brindisi, about fifty miles from my residence (Bologna), I inspected some artesian wells bored for petroleum under the management of Engineer Chls. Ribighini, who was many years in the American oil regions. The first attempt in Italy to find petroleum was made in 1864, by this same gentleman; but it failed for want of experience in the business.

Successively, in 1872, '73, '74, and '76, new attempts were made by other Italian engineers. All failed, owing to want of experience in the business, as well as for want of sufficient means.

The attempt made in 1864 was in Tocco Causaria, Province of Chieti, South Italy. The oil there seemed rather a bitumen of asphaltic nature. Gravity, 900° to 920°.

Other attempts were made in Central Italy, chiefly in the Provinces of Parma and Piacenza, at Ozzano, Miano, Langhirano, Montechino, and Veleja, where the oil is of superior quality, much like best Pennsylvania crude oil, 810° to 830° gravity.

In 1880 a French company took up Tocco Casauria and Rivazzano in Lombardy again, and three wells were bored in the former place by regular American systems and laborers. Oil was found in one of them, which ever since continues producing a small, but still paying, quantity of the same asphaltic oil.

Work, however, was suspended for want of money. At Rivazzano, four wells were bored, all down to 1,000 feet, but were suspended for want of the requisite tubings and other machinery to finish them. The indications of oil, however, seem to have been promising.

Here at Salsomaggiore, drilling was started in March, 1884, and five wells have been finished at various depths, from 500 to 2,200 feet. All of them showed oil, and two are still producing petroleum in paying quantities, though now reduced to two or three barrels a day.

A French company again started works here this year in May, also with Mr. Ribighini as consulting engineer.

One well is down 1,000 feet, with good oil indications, and another, started two weeks ago, is down 200 feet already.

Nothing can be more Americanly organized than these wells. Machinery, boilers, and engines are from Farrar & Trefts, of Buffalo, N. Y. Casings and pump tubings all American. The tools and rig have been perfectly imitated, in Italy, from American patterns.

The workmen are all Italians under an American foreman, who speaks highly of their skill and activity.

Whatever may be the success of this French company, I do not think the Italian petroleum wells will ever affect the American oil trade materially, for the following reasons:

1. The production of the wells, so far at least, seems small. Twenty barrels a day was the best of the five wells, which soon fell to two or three barrels, and so remains.

2. Cost of drilling is comparatively large, as they require to go down 1,500 to 1,600 feet, where oil seems most abundant.

The ground is loose, and requires much time and many columns of artesian tubes to keep it from caving in.

The cost, as far as I could understand, of one of these wells is from $4,000 to $6,000, exclusive of machinery, rigs, tubings, and tools.

3. The greatest drawback of all is the difficulty of finding sufficient capital for such speculations in Italy.

Italians are, as a rule, very skeptical as to any mining business, especially oil operations, and Europeans in general are more or less of the same disposition. Consequently, want of capital will always be the great impediment.

Could capital be procured, the advantages would be:

1. That it is now proved that the oil exists in Italy in paying quantities and over an immensely extended area, traces of it being found all along the last spurs of the Apennines, beginning at Genoa, Voghera, Piacenza, Parma, Modena, Bologna, and all the way down to Sicily, on Adriatic as well as on Mediterranean side.

2. The wells lately drilled have lasted a long time. The first, struck in July, 1884, is still in action, producing, as I stated, three barrels a day. The gas seems to be just the same to-day as when first struck, and is used in the village for lighting hotels and other establishments. Also in many houses for cooking.

3. The cost of running them is nominal, as they eject every one of them a large quantity of salt water with a little oil gas, and consequently only require a man to gather and barrel the oil.

In this way everything can be removed, and a single rig and set of machinery can be used, over and over again, to bore many wells. Laborers cost two to three francs a day.

4. And greatest advantage is the duty on foreign oil, so high that duty-free American refined oil sells at twenty francs for 100 kilos. Whereas, duty paid, it is sold for 67 to 68 francs.

Italian petroleum is free of tax, and will probably remain so many years.

In conclusion, I have no doubt that American capital and American enterprise, alone, could make this Italian petroleum business an important and paying one.

As it is, and as it will be, in European hands, no apprehension need be felt of its ever becoming dangerous to the American oil trade with Italy.

CARLO GARDINI, U. S. Consular Agent.

Bologna, September 5, 1887.

The Manufacture of Cachets and Wafers.

The recent death of Limousin, the inventor of the wafer capsules (cachets, capsulæ amylaceæ), suggests the idea of again drawing attention to the utility of this form of medication.

While it would be an unprofitable undertaking for every dispensing pharmacist to undertake the preparation of his own wafers, it is believed that a profitable business could be carried on by at least one, or perhaps even more, manufacturers in each country. To a certain extent, the choice of this form of medication depends somewhat upon the rate with which its existence or availability is kept before the memory of the prescriber. It only needs a slight impetus, from time to time, to cause a preference in favor of the wafer capsule over some other forms of medication, although it is by no means intended to assert that this is in all cases the best form. We believe, however, that it is, for instance, preferable to gelatin capsules, in the case of quinine.

Formerly, the wafer capsules were pressed from the large square wafers (for which Nuremberg has long been celebrated). At the present time, however, they are baked specially. The cost of fitting up a factory is very small, and the arrangements required are simple, requiring but little room and only cheap labor. The most expensive item of the whole is the forms. These are made of two hinged pieces, the material being either steel or brass. One of the plates contains the concave, the other the convex pattern of the wafers.

These forms rest upon one or more specially constructed ovens heated either by gas or wood charcoal. As soon as the opened forms, resting on the hot oven, have acquired the proper temperature, which is easily recognized by allowing a drop of water to fall upon them, a certain quantity of a mass prepared from wheat starch is spread upon one of the plates and the other plate gradually folded over it. The latter, through its own weight, expands the mass so that it forms a perfectly uniform layer. The excess of the mass, which is squeezed out at the side, is simply scratched off. The forms are then opened, and the completely baked sheet taken out. This sheet contains as many half wafer capsules as there are patterns. When freshly taken from the form, these sheets are very brittle, but after being laid aside a few days, they absorb enough moisture from the air to permit being cut or trimmed. The next operation then is the cutting or punching out of the round wafers. For this purpose there are used either simply punches or punching machines worked by treadles, by means of which each separate wafer is cut out. These are then counted and put up in packages. A well trained girl is able to bake, in one day, 20,000 such wafers, and it requires the service of only two girls to punch these.

The mass of which the wafers are composed consists of the purest wheat starch, mixed with water. The best fuel is either gas or wood charcoal. There being only a few requisites, it will be easy to calculate the cost of a day's turnout.

The whole art and mystery of the manufacture centers in the forms, which must be absolutely true and perfect. If the forms are not exactly true, the wafers will be uneven. The least defect of the forms will be prominently visible upon the product.

The preparation of flat wafers, such as are used for making sealing wafers, sacramental wafers, wafer bottoms for ginger cake, etc., is much more simple than that of the medicinal wafers. The former are baked in similar metallic forms, which are, however, entirely smooth inside. The thickness of the wafers depends, of course, upon the distance intervening between the plates when they are closed.—*Amer. Druggist.*

FROM twenty-five to forty car loads of grapes and pears have each week for some time been leaving California for the East. Chicago is the best market for California fruit, and Denver ranks next.

Impending Change in Street Car Propulsion.

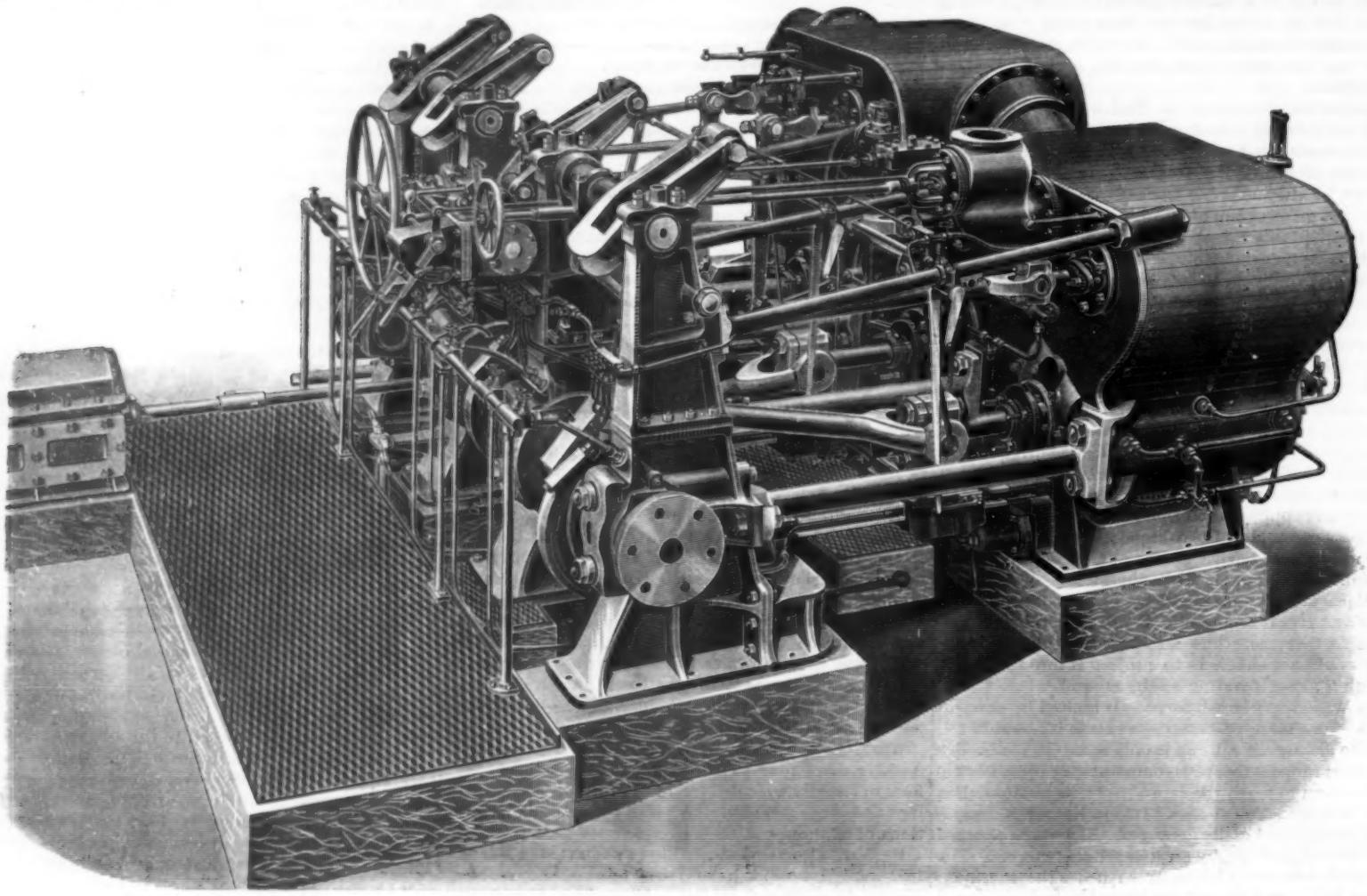
In his recent remarks before the American Institute of Electrical Engineers, Mr. Anthony Reckenzaun said:

With regard to the general application of electricity to street car propulsion, there is a very great future in store for us, and the time is very near when horses on street cars will be entirely abandoned. We have, I might say, almost passed the experimental stage, and we are now entering the more profitable stage of manufacturing and supplying street railways with electric motors. The advantages in electric motors are not only economy, but cleanliness and great saving of space at the depots and great saving of space in the streets. If you take crowded streets like Broadway, New York, and many other thoroughfares where every square inch of space in the street, you might say, is of value, and do away with horses, you save in length about twelve feet, and in width, of course, the width of the track. Now, it would seem ridiculous for me to make such a remark, but if there are hundreds of cars running in a crowded street, it makes many thousand square feet of space saved, and in that space other vehicles can pass. Another great advantage in electrical propulsion will be (apart from economy, which is certain to be a result) that we shall be able to travel at a greater speed. Horses cannot pull a car at a greater speed than six miles an hour. The average speed of all the horse cars in America and Europe is five miles an hour, including stoppages. Now, if we can travel at the rate of eight or ten miles an hour, a great deal of time will be saved, and passengers will avail themselves more of the new mode of traction. They will save a great deal of time. The traffic is constantly increasing. I have heard recently that the street car traffic of New York alone has increased in the last ten years fifty per cent. If it increases in the next ten years another fifty per cent, it would be impossible to cope with the traffic at all if we employ horses. The elevated railroads, it appears, are doing a large amount of business, almost as much as they are capable of doing, and the only loophole, it seems to me, out of the difficulty is either by building underground railroads or by propelling the street cars at a greater speed, so that the same number of cars will carry double the number of passengers in the same time.

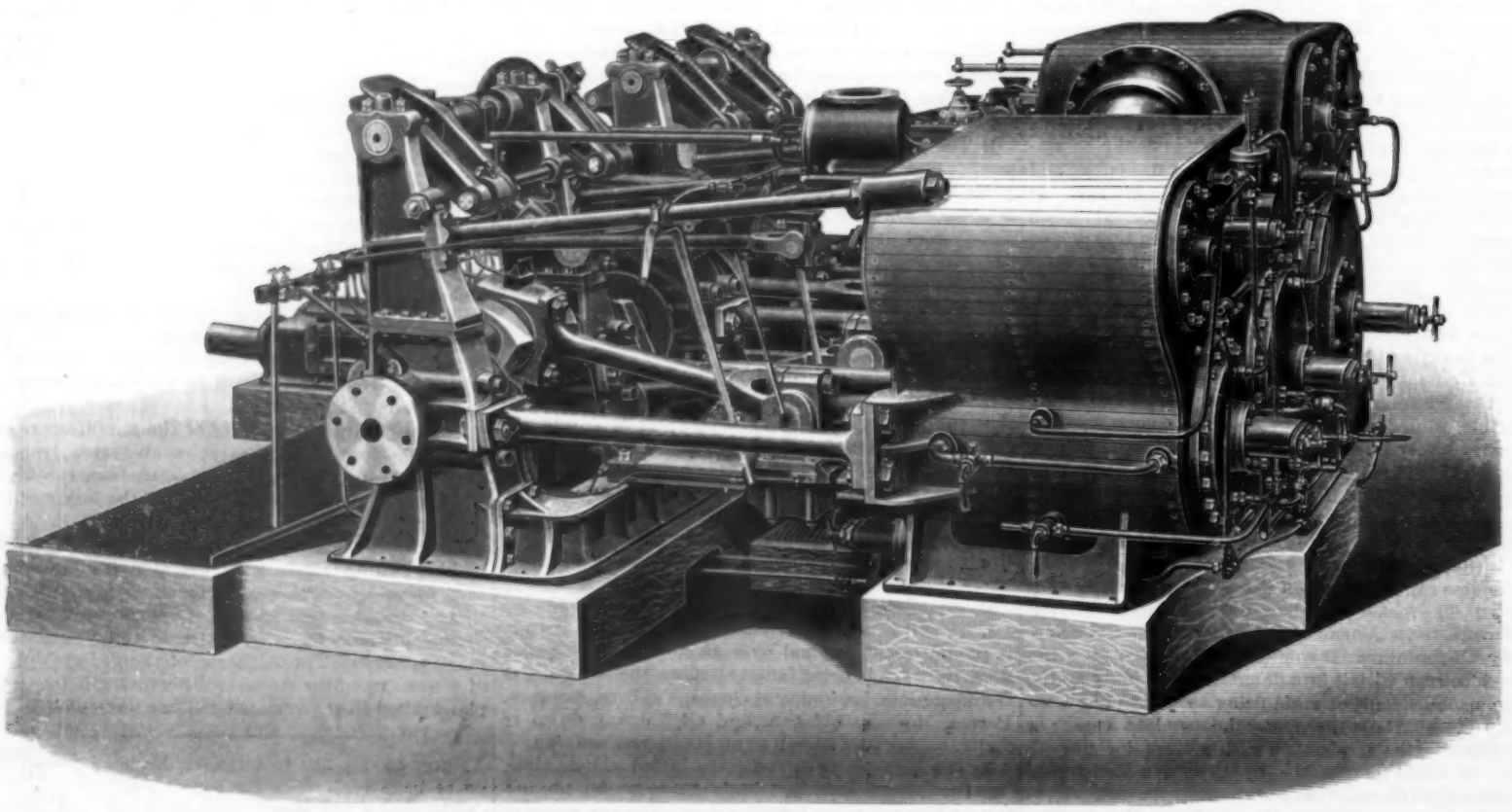
ENGINES OF THE DOGALI.

The Dogali is a new and powerful war ship constructed for the Italian government by Sir William Armstrong, Mitchell & Co., Newcastle-on-Tyne. We give a sectional elevation and perspective views of the engines as they stood in the erecting shop, for which we are indebted to the *Engineer*.

This vessel is the first war ship fitted with triple expansion engines. They were made by Messrs. R. & W. Hawthorn, Leslie & Co., of Newcastle-on-Tyne, and are of the twin screw horizontal type. Each set of main engines has three cylinders, 30 in., 45 in., and 73 in. diameter, with a stroke of 2 ft. 9 in. The piston valves are worked on Marshall's system, which admits of a very large range of expansion being adopted, and gives as equable a distribution of steam when working



IMPROVED TRIPLE EXPANSION ENGINES.



IMPROVED TRIPLE EXPANSION ENGINES OF THE ITALIAN CRUISER DOGALI

at low speeds as when working at full power. The propellers are three-bladed. The whole of the engine pumps are driven by separate independent engines. The condensers are of brass. Steam is supplied from four boilers, each having six furnaces, capable of being worked either with natural or with forced draught. The air for the forced draught is supplied by eight fans, each driven by a separate Brotherhood engine. The whole of the auxiliary engines may be made to exhaust either into the main condensers, auxiliary condenser, or into the atmosphere. The engines are situated in two separate water-tight engine rooms, the communication between which may be closed at any time by water-tight doors moving horizontally, worked from the deck. The boilers also are placed in two water-tight stokeholes. This subdivision of the vessel, and the fact that the whole of the auxiliary engines, as well as the main engines, are in duplicate, renders the chances of a complete breakdown very remote. During the trial the engines worked well, running at a speed of 155 revolutions per minute, and developing a power of over 7,600 horses, the vessel attaining a speed of 19·66 knots per hour.

Refining of Fuller's Earth.

Until about three years ago the valley which lies between the village of Combe Down and Midford Castle, near Bath, England, was one of the most peaceful and secluded spots to be found in the whole of England. Along the slope of the hill at the upper end lay rich and fretile gardens, whose rows of luxuriant fruit trees seemed to melt almost imperceptibly into the woods that clothed the greater part of the north side. The opposite hill was mostly pasture land, but, toward the lower end of the valley, it also was covered with a thick hanging wood, out of which peeped the quaint little spire of the keeper's lodge, and, higher up, the peculiar trefoil-shaped tower of the castle itself. None of the land being under cultivation, and the valley not being on the road to anywhere in particular, there was neither traffic nor labor to disturb its quiet, and the wild birds and animals were left in peace throughout the greater part of the year, until, with the fall of the leaf, came gun and beaters to startle them rudely out of their fancied security. The valley is still, to outward appearance, much the same as ever, but its privacy and seclusion have been invaded; large excavations have taken place on the brow of the further hill, and a snorting steam engine at the bottom of the hollow gives evidence, by its unromantic presence, of the pitiless march of progress and the universal struggle for existence.

It was in 1883 that, a large deposit of fuller's earth having been discovered near the summit of the hill in question, a company was formed for the purpose of working it.

Fuller's earth is found in considerable quantities in many places in the neighborhood of Bath—such as Lansdown, Combe Down, Wellow, and Midford—and in these places it has the same geological characteristics, that is to say, it crops out, in all cases, about 80 feet below the brow of the hill, and runs in a horizontal seam about four feet deep right across to the opposite side, where it again comes to the surface. The outer portion of this seam, for about 100 feet into the ground on either side, is of a yellow color, while the earth in the middle is all blue. This effect is, I believe, produced by its greater or lesser proximity to the surface strata in each case. Although the color of the earth varies in this way, the chemical composition of the two kinds is precisely the same, and opinions differ as to which is the best. It would appear, however, that the consumers have their own ideas on the subject, those who use blue earth refusing with scorn anything to do with the yellow variety, while the purchasers of the latter are equally decided in their condemnation of the blue. The question, however, is as unimportant to society at large as was the famous contest between the blues and the buffs which, in days gone by, distracted the independent electors of the borough of Eatanswill, so we will pass on to consider the way in which the earth (of whatever color) is prepared for the market.

The method of Mr. Dames, which is used at the Midford works, consists of a new and beautifully simple way of separating the pure fuller's earth from all extraneous matters, such as shells, stones, gravel, and insoluble line. When this has been done, the earth only requires to be thoroughly dried and is then ready for sale. The latter part of the operation is no novelty, but Mr. Dames' plan is the only one by which the separation can be effectually accomplished and the commodity produced in a perfectly pure condition.

The advantage of this to the consumer is, of course, immense, since, when he buys the imperfectly cleaned article, he is not only apt to find that the cloth to which it is applied is damaged by the presence of foreign bodies, but he is also paying a higher price for the carriage of gravel and dirt, which cannot be looked upon as an advantageous speculation.

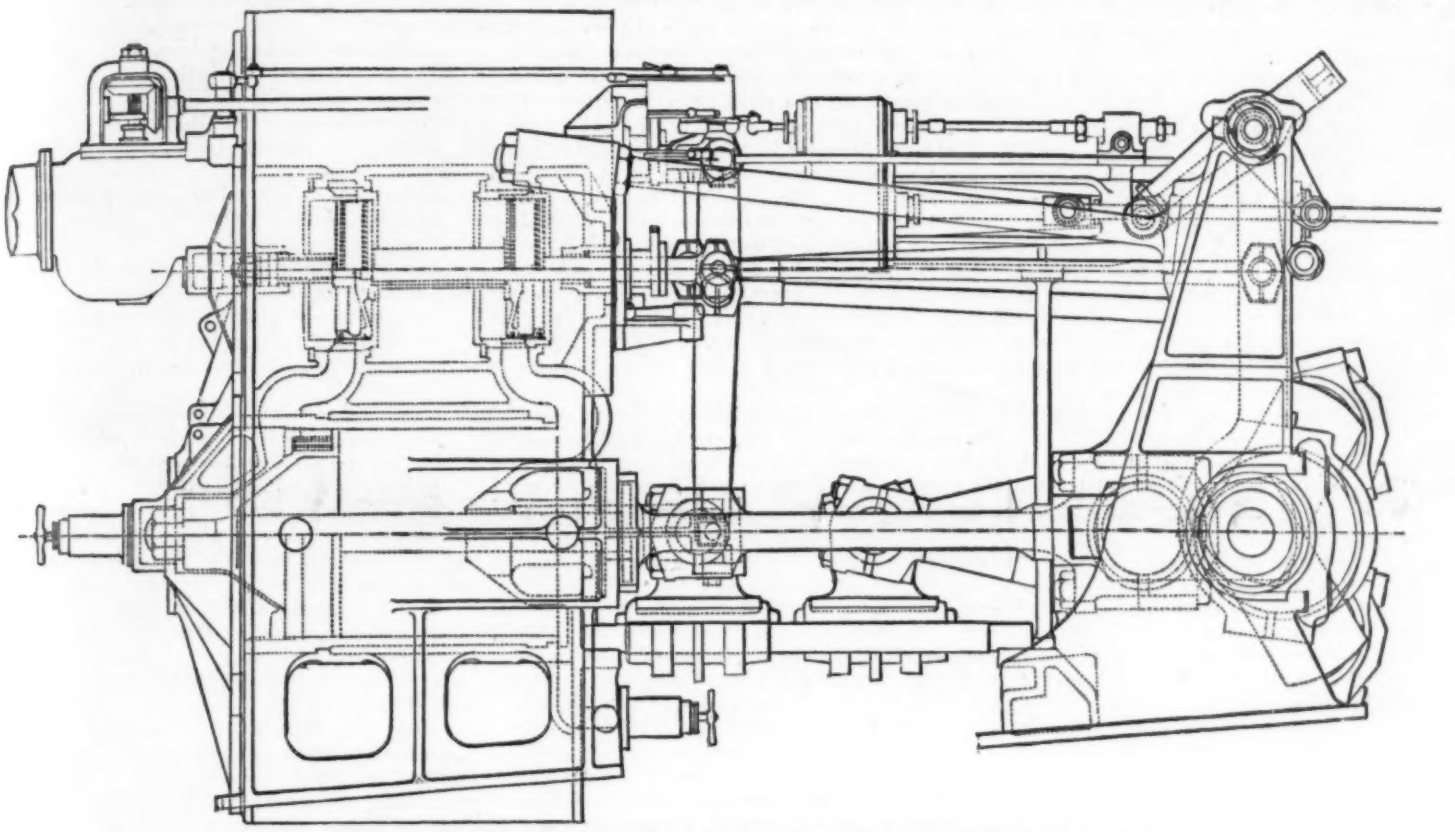
The works at Midford are built close to the Somerset coal canal, at the lower extremity of the valley of which I have been speaking. The deposit of earth being at the top of the hill, and at a considerable distance up the valley, a system of conveyance had to be organized by which the raw material could be brought in the cheapest manner to the tanks and receptacles prepared for it. Advantage is taken of a small stream of water which runs at the base of the hill to carry it down to the works without any expense, and at the same time to prepare it, to a great extent, before it reaches them. It is done in this way. From the spot where the raw earth is dug out of the hill side a double line of rails is laid to the bottom of the valley—a very steep incline. The earth is run down these rails in trucks, which travel by their own weight, each full one, as it descends, drawing up an empty one on the other line, the rope passing round a drum at the top. When the truck load reaches the bottom of the hill, it is put into a "pug mill" and ground up, with about three times its own bulk of water. This "pug mill" is worked by the steam engine to which allusion has been made, and consists, essentially, of a large circular vat or tank round which two heavy rollers are constantly traveling, so as to thoroughly crush, disintegrate, and, generally speaking, churn up the mixture of earth and water.

When the churning is completed, the compound, technically known as "slurry," is turned into a series of little tanks, or "catch pits," close to the engine. All the pure fuller's earth is now in a state of suspension, being but little heavier than the water. The coarser matters, however—gravel and stones and such like—soon sink to the bottom by their own weight, and a great deal of the purification is thus speedily accomplished.

The pea-soupy-looking fluid, containing still a certain amount of extraneous matter, is then allowed to run into a long earthenware drain, laid underground, which carries it straight down to the works, nearly a mile away. When it emerges at the other end, it is caught in a long shallow trough, called a "maggie." As it slowly flows along this trough all the particles of dirt and sand, which keep sinking to the bottom, are caught and detained by a series of little wooden steps placed across the bottom, which rise only a short way up into the liquid. It is, in fact, a kind of inverted process of skimming. By this means, when it reaches the end of the "maggie," the fuller's earth is in a perfectly pure condition, and only requires to have the water dried out of it. In order to do this it is first run into enormous tanks, of which there are four at the works, the largest capable of holding somewhere about 1,000 tons. Here it is allowed to stand until the gradual settlement of the suspended earth allows the water to rise to the top. The tank is provided with a kind of sluice gate and a board with perpendicular row of holes, about two inches in diameter, stopped by wooden pegs, so that when the sediment has sunk below any one of these holes, the peg can be knocked out and the surface water allowed to drain off, in a perfectly pure and drinkable state and very soft. Then, as it still gradually settles, another peg is removed, and so on. At last it will sink no lower, the last peg hole has done its work, and a damp mass remains at the bottom. To bring it to this condition generally requires about thirty days.

It will not dry any more by itself now, so means have to be taken to get rid of the rest of the moisture. The first step in this process is to put it into an enormous tank, under cover, like a huge swimming bath, 160 feet long, with a floor made of porous tiles. Underneath this floor are nine wide flues, running from a furnace at one end of the drying tank to a tall chimney which stands at some distance from the other end; the top of this chimney is quite 300 feet from the furnace. Now, when a roaring fire is kept up in the latter place, which is fifteen feet in width and eight in depth and has three fire doors, a tremendous draught is, of course, created between the fire and the chimney. This draught, together with the rarefaction of the air by heat, has a tendency to produce a vacuum in the long flues that run underneath the half dry "slurry" in the tank, and so strong is the tendency that the water remaining in it is drawn down into the flue, in the shape of steam, through the earth and porous floor, and is expelled in a cloud at the top of the tall chimney. The drying shed looked like a great caldron of boiling mud, the surface heaving and quivering, and covered with bubbles which rose in every direction and burst in little jects of steam.

Fuller's earth is used principally for scouring and "fulling" cloth, because it has the property of readily absorbing all oil and greasy substances. Besides its utility in the cloth manufactory, it is largely used for refining oil, and is also employed in dressing wounds, while of its soothing qualities when applied to the skin more will shortly be heard.—*Bladud.*



TRIPLE EXPANSION ENGINES OF THE ITALIAN CRUISER DOGALI

The Art of Flavoring.

Preparatory to giving recipes for cordials or liqueurs, it would be well to record some sort of protest against the use of certain artificial chemical flavorings, which are sold under the name of essences as often as not, without being anything like so harmless or so pure. In the report of the juries to the great exhibition of 1851, we find the following remarks, that are sufficiently interesting to be quoted at length: "Several of the perfumes, or rather essences, exhibited are of a particular interest, and deserve our especial notice. We allude to a series of artificial organic compounds possessing qualities which permit of their substitution for natural volatile oils and essences. Most of them are substances belonging to the group of compound ethers.

"The fruity odor of these bodies has been long known, but they do not appear to have been used in flavoring until the chemist had shown that many of the oils of vegetable origin resemble in their composition the above mentioned products of the laboratory. For some years past a scent called wintergreen oil has been extensively used in perfumery. It is obtained from an ericaceous plant, the *Gaultheria procumbeus*, and is imported from New Jersey in America, where it is obtained in considerable quantities. Chemical analysis of this oil has yielded the interesting result that it is a true compound ether, consisting of salicylic acid and pyroxylic spirit, which may be formed by a combination of its proximate constituents, so as to possess all the characters of the natural substance. This observation was not lost upon commercial enterprise, and several of the numerous ethers prepared by the chemist were soon discovered to possess the odor of certain fruits in so marked a degree that it was difficult not to conclude that the fruits in question owed their smell to these ethers."

This would appear to convey an argument in favor of these artificial essences; but, although it may be urged that the compounds are almost exactly like the fruit essences, yet that "almost" may suffice to make the difference necessary for their condemnation, and render them deleterious, if not actually poisons. It must not be supposed, however, that we are condemning artificial essences wholesale, for there are many sent into the market by trustworthy chemists that are not only quite harmless, but positively superior in their delicacy to anything that could be produced from the actual fruit.

There are several artificial essences of this kind. Neither the time nor the quantity of material at the command of the reporters permitted them to examine all these products. They were, therefore, obliged to confine themselves to a notice of the following:

Pear oil is a spirituous solution of acetate of oxide of amyl. The latter may be obtained with facility and to any amount by distilling equal parts of concentrated sulphuric acid and fusel oil (the oily residue obtained by the rectification of potato or grain spirit) with two parts of acetate of potash.

It is remarkable that the ether itself does not possess a very pleasant odor, and that its striking resemblance to that of pear does not become apparent until properly diluted with spirit. Artificial pear oil is now prepared in large quantities in England. It is chiefly employed in the manufacture of the lozenges called pear drops, of which the exhibition presents some specimens, so that the flavor in its applied state may be tested side by side with the perfume.

Apple oil consists mainly of valerianate of oxide of amyl. It is obtained as a secondary product in the preparation of valerianic acid, by the distillation of fusel oil with bichromate of potash and sulphuric acid. The distillate has to be shaken up with a dilute potash solution in order to remove the valerianic acid, when the ether floats on the top, and may be removed with a pipette.

Pineapple oil is contributed by most of the exhibitors of artificial essences. The specimen analyzed was found to consist almost exclusively of butyrate of oxide of ethyl. It is easily obtained by boiling butyric acid (obtained from sugar by fermentation with putrid cheese) with strong spirit and a small quantity of concentrated sulphuric acid. It resembles the acetate of oxide of amyl in not presenting the characteristic agreeable fruity flavor in a pure state; it requires to be considerably diluted before the odor appears. The oil is largely manufactured in England, and is employed in the preparation of a beverage called "pineapple ale."

The process commonly used for its preparation does not yield perfectly pure butyric ether. It consists in saponifying fresh butter with potash. The soap that forms is separated from the liquor, dissolved in strong alcohol, and distilled with concentrated sulphuric acid. This yields a mixture of butyric ether and various other ethers, but the liquid obtained is perfectly adapted for the purpose of flavoring.

Cognac Oil and Grape Oil.—Specimens of these oils, especially of the former, are contributed by English, French, and German manufacturers. They seem to be often employed with the view of giving ordinary varieties of brandy the prized flavor of genuine cognac. Unfortunately, the samples exhibited are too small to permit of a careful analysis. A few superficial examinations proved undoubtedly that they are compounds of fusel oil dissolved in a large quantity of alcohol; and it is curious that a substance which is most carefully eliminated from brandy on account of its offensive flavor should be introduced in another form and in minute quantities in order to render the same beverage aromatic.

Artificial Oil of Bitter Almonds.—As early as 1834, Professor Mitscherbich, of Berlin, pointed out a peculiar liquid formed by the action of fuming nitric acid upon benzole, and possessing the odor of natural oil of bitter almonds in a high degree. It was called nitro-benzide or nitro-benzole.

Dr. Hassall says in his "Food: Its Adulteration": "Another essence extensively used for flavoring sweetmeats and confectionery is ratifia, essential oil of almonds, essence of peach kernels, or hydride of benzoyl. It is obtained by distilling bitter almond cake with water, and it contains from six to twelve per cent of prussic or hydroganic acid, but is most variable in its strength. As small a quantity as twenty drops has been known to occasion death."

There is another compound of prussic acid, called "almond flavor." It contains about one drachm of essential oil to seven drachms of spirit, but its strength varies very much. Many fatal cases have resulted from the use of this flavoring substance.

Professor Taylor, in his evidence before the Parliamentary Committee on Adulteration, declared that the presence of prussic acid in these almond flavorings was not at all necessary to the power of their flavor, and added, with much feeling, "There is no excuse for selling prussic acid in these compounds but laziness and ignorance," and we are fain to agree with him.

Raspberry flavoring for sugar confectionery is made entirely of currant jelly and orris root; "but," adds Dr. Hassall, "organic chemistry has in these days reached such a pitch that the odor and flavor of almost any fruit is capable of being imitated. We have recently received samples of the following artificial fruit essences: Essence of apples, pears, quince, pineapples, raspberries, strawberries, cherries, peach kernels, rum, gin, cognac, maraschino, hops, vanilla, parsley, celery, and curry powder," and tacitly confess that he has found no harm in either.

Without overlooking or ignoring the value and ingenuity of these discoveries, our inclinations naturally lead us to prefer the non-artificial essences made from the fruit or material itself; but, in regard to cost or labor, the artificial cannot be satisfactorily compared with that which can be purchased of the manufacturing chemist.

The correct method of preparing *bona fide* essences is by distilling the substance in alcohol, when the spirit comes over laden with the aromatic principle; but that must be left to the manufacturing chemist.—*Theodore F. Garrett, in Practical Confectioner.*

Forms of Bird Life in Central Texas.

E. M. HASBROUCK.

To the ornithologist who visits Texas for the first time, nothing is more striking than the meeting with species which he supposes he has left far north, and the apparent scarcity of others new to him. These features may be traced to two direct causes, first of which is the same old story of visiting a new country, being unacquainted with the "station," so to speak, the foliage different to that in which one has been accustomed to hunt, and the lay of the land; second, to the fact that one cannot help retaining the idea that those species which migrate north do so in a body and as a whole, while in truth many change their abode only in part, leaving countless numbers who remain in the winter home throughout the year. Conspicuous among these is the common little mourning dove (*Z. carolinensis*), which, as far as my observation goes, is to-day the commonest bird in the State. Every hill, mountain, and plain is inhabited by thousands and thousands of them, and the most striking feature in connection with these is their tameness. Every one aware of their extreme shyness and timidity at the North, can imagine my astonishment on finding that the old saying of "Put salt on the tail" could almost be fulfilled on these very birds. In connection with the mourning dove, one point is worthy of notice—the lateness to which the breeding season is carried; for while collectors believe that the breeding season closes in the South at a much earlier period than that at the North, with this bird at least it is protracted far beyond any date at which I have known it to be in the Middle States, as I have taken the nests containing eggs in all stages of incubation throughout the summer, and as late as August 26 found one with eggs perfectly fresh. Do not suppose that this bird furnishes the only instance of late breeding, as many others could be cited, and among them that of the scissor-tailed fly catcher (*Milvulus forficatus*), on July 9, and the chaparral cock (*Geococcyx californianus*) July 29. Other instances are on record, but this is sufficient to show that nidification is protracted by many species in Texas to a period exceeding tnat at which the latest breeders of the Middle States (*S. tristis* and *A. cedroneus*) have nested. What, then, can be the cause for such tardiness? Is it that the birds, knowing the length of the seasons here, are slow to mate, preferring to take matters easy and breed all in good time? Or is it that the heat of the climate to a certain extent affects birds the same as it does the inhabitants, making them lazy and indolent? Or perhaps we can hit the mark closer by taking into consideration the fact that some species raise two, and even more, broods a year, and that here the number is increased. This certainly looks the most reasonable, and is, I think, a fair answer to the above questions—but enough.

On arriving here, one is told that the scissor-tails and chaparral cocks are very common, and yet, as hinted above, until acquainted with the "station," he will search for them in vain, declaring Texas to be a fraud and the people liars. Then, when he does meet with them in abundance, he never fails to reflect on his own foolishness and fallibility. Starting again with our first subject, from which I have somewhat wandered, we will treat first of those birds found both here and in the Middle States. These, as near as I have been able to observe thus far, are represented by twenty-four families, divided according to the following schedule:

Turdidæ—mocking bird, bluebird.
Sylviidæ—blue gray gnat catcher.
Paridæ—tufted titmouse.
Sittidæ—white-bellied nuthatch.
Troglodytidæ—Carolina wren.
Vireonidæ—white-eyed vireo.
Laniidæ—loggerhead shrike.
Hirundinidæ—white-bellied swallow, cliff swallow.
Tanagridæ—summer redbird.
Falconidæ—sparrow hawk, red-tailed hawk, red-shouldered hawk.
Cathartidæ—black vulture, turkey buzzard.
Charadriidæ—killdeer.
Fringillidæ—cardinal.
Icteridæ—meadow lark, crow, blackbird.
Corvidæ—common crow.
Tyrannidæ—kingbird, wood pewee.
Caprimulgidæ—night hawk, whip-poor-will.
Picadæ—pileated woodpecker, red-headed woodpecker.
Alcedinidæ—belted kingfisher.
Cuculidæ—black-billed cuckoo, yellow-billed cuckoo.
Strigidæ—barred owl, horned owl.
Columbidæ—mourning dove.
Ardeidæ—great blue heron, green heron.
Scolopacidæ—least sandpiper, greater yellow-legs.

Thus making a total of thirty-seven species whose geographical range extends from Texas to New York. These are all more or less common, inhabiting the tracts of land similar to those they frequent elsewhere, the meadow lark alone showing any difference in habits, and this noticeable only in his comparative silence.

Turn now to Texas birds proper, taking up only a few of the most striking, found in the central part of the State, and which the new-comer first meets. First among these let me place the scissor-tailed fly catcher (*M. forficatus*), or "paradise bird," as they are called by the people. This last name, while doing well enough here, although applied to an elegant bird, hardly applies in the mind of him who has seen the true bird of paradise. These fly catchers are one of the commonest birds in Texas, frequenting every place, excepting the heavy timber and mountain tops, preferring the open, mesquit flats to other places, and here hundreds may be seen in a few miles' ride, sometimes singly, more often in companies of five to a score, darting through the air in every direction, and screaming vociferously. To one who sees them for the first time, a thrill of delight at beholding a creature so beautiful shoots through the mind; but when awakened before daylight, morning after morning, the thrill of delight changes to one of righteous indignation, and after seeing them constantly for a week, they become tiresome and even distasteful. It is a relief to leave the open land and seek the shelter of the scrub cedars and oaks, the abode of the chaparral cock. Here, while passing through the timber, one suddenly espies one of these strange birds, bearing a near resemblance to the peacock, but in reality belonging to the *Cuculidæ*. Although a shy bird by nature, if approached cautiously they seem to be anxious to show themselves off, and frequently come out into the road before the traveler, strut about with tail spread and head thrown back, seeming to court attention. Then, mounting a tree or bush close beside you, he will sit for some time as if to have a better look at you. Although afraid of an approach, noise seems to possess little or no terror for them, as I fired twenty-four shots at one, one day, with my revolver while thus perched, always taking good care not (?) to hit him, and he never budged. The local name for these birds is "road-runner," and truly this name is appropriate, for at times they will run the road just ahead of you for some distance, and no matter how good a horse you may possess, they will outstrip him. They prefer running to flying, even when hard pressed, and are said upon good authority

to outrun the best horse in a fair race. The people frequently take them when young, as they are easily domesticated, and make very interesting and amusing pets.

Among the smaller birds, two are more noticeable than any others, and for widely different characteristics. The painted bunting (*P. ciris*), for its brilliant colors, and the lark sparrow (*P. anthinus*), for its sweet though harsh song; the one being found in the timber tracts of the river bottoms, the other being common nearly everywhere, going in flocks of a dozen or more, and, when singing, mingle their song with a peculiar harsh, rasping note thrown in with every three or four, which makes the whole song highly amusing and interesting. These are but four out of many to be found here, but as yet they are all that I have had time to secure and positively identify. There are quantities of small birds, wrens, vireos, fly catchers, etc., which, although I have seen, have not had the time to collect. At my earliest opportunity, however, I shall do my best to make a careful investigation, and write you the results.

CHEVREUL AT 101 YEARS.

Mr. Chevreul has just entered upon his hundred and second year. Mr. Nadar on this occasion has taken an instantaneous photograph of the illustrious savant, which we here give an exact reproduction of. The venerable dean of students has not ehanged physiognomy since his centenary. The imposing national fete which was celebrated last year was a bath of youth for him. Always just as vigorous, sprightly, and cheerful, Mr. Chevreul imperturbably continues to devote himself to his multiple labors and to fulfill his official functions. The day of the one hundred and first anniversary of his birth, he presided at a session of the Agricultural Society, and was present the next day at the weekly reunion of the Academy of Sciences, receiving with joy and serenity the congratulations of his colleagues, and shaking hands with everybody. The Anjou Wine Society afterward sent its congratulations to him, and he addressed to the delegates a charming little speech full of wit and humor. Telegrams and letters of congratulation poured into his dwelling all day long, while at the same time all the rooms of his house were converted into conservatories.

In the evening, Mr. Chevreul's old domestic asked him with solicitude whether he did not feel fatigued by the day's labor, and advised him to spare himself, on account of his great age. "In fact," answered Mr. Chevreul, "I *am* beginning to get a little old, and shall take some precautions." There is a charming irony against old age in this reply, and a promise of a renewed longevity which we hope may be realized. Everything gives us a guarantee of it, and we may, without fear, offer ourselves the luxury of a prophecy, based upon a certainty, that in a year science will have to congratulate Mr. Chevreul on his triumphant entrance upon his hundred and third year.

The venerable patriarch has often been asked what secret he has used to reach his hundred years without infirmities and without a particle of change in his great intelligence. "I do not drink wine," answers he, imperturbably. This is a witty, evasive reply. We must seek for the cause of this happy longevity in a severe moral and intellectual hygiene. We address our respectful felicitations to the illustrious savant, and our wishes for his good health. His long life so fruitful, his green old age so active, is an eloquent lesson for youth. It proves that the best means to live and become old is to work constantly and much.—*Paris Illustre.*

MR. CHEVREUL AT 101 YEARS OF AGE.

The Significance of Left-handedness.

An editorial writer in *La Normandie Medicale* has taken the trouble to summarize and compare certain observations on this subject, and he thinks that it is not wholly elucidated by M. Galippe's generalization that we are right-handed by atavism and left-handed by morbid heredity. He implies also that it is not altogether to faulty education that left-handedness is to be attributed, and suggests that it might be useful to seek for a solution of the problem in comparative anatomy and pathology, by endeavoring to ascertain if the lower animals do not show a predominance of one side over the other. The writer first considers M. Debierre's investigations by comparative measurements of the bones of the right and left limbs in infants. These measurements show a slight excess in the average length of the left os brachii, but, curiously enough, in that of the right radius and femur; and there are persons, it seems, who, being right-handed, have the left lower limb somewhat more developed than the right, and those also who, being left-handed, have the right lower limb predominating over the left. But all these differences in the length of the bones are inconsiderable, and in M. Debierre's opinion they are not original, but created by habit, so that our primordial type was that of ambidexterity, and it is only by education that we become right-handed or left-handed.

M. Galippe considers left-handed persons as in a certain sense degenerate, and he seems to regard left-handedness, as well as squinting, mother's marks, supplementary fingers, hare-lip, prognathism, and other like blemishes, as implying a disposition to physical, moral, or intellectual deficiency. It is stated that many epileptics are left-handed, and figures are given showing that 4·13 per cent of insane men and 4·27 per cent of insane women are left-handed, but these percentages do not seem to vary strikingly from those found among healthy persons. Among criminals, however, according to Marro, the proportion of the left-handed is much greater—13·9 per cent in men and 22·7 per cent in women. Anomalies in general are said to affect the left half of the body more frequently than the right, and the experience of dentists is brought forward by M. Galippe as showing a very common exemplification of the fact, dental caries being declared to be oftener met with on the left side than on the right, as well as the non-appearance of the wisdom teeth or the occurrence of derangement of the health at the time of their appearance. Moreover, it is alleged that the teeth of the right side are generally somewhat larger and harder than those of the left side. On the other hand, irregularity of the canines is set down as more common on the right side. The left half of the jaw itself is said to be somewhat less developed than its fellow, as a rule.

It is evident from the facts brought out in these various inquiries that the question of the cause or causes of left-handedness is not a simple one, and it may be said, in particular, that the occasional coincidence of a predominant right arm and a more highly developed left leg, and *vice versa*, seems to vitiate the theory that refers the preponderance of one side to an encephalic inequality.—*N. Y. Med. Jour.*

What the Morphine Habit Will Do.

The ingenuity of morphine victims to hide their vice has never been better illustrated than in the case of a young girl at a fashionable young ladies' boarding school near Philadelphia, as told by a contemporary.

The disclosure came about accidentally. When the young student returned to the school this fall, she had periods of deep despondency, and often asked the privilege of going to the room in the seminary set apart as a hospital. There she would lie for a day at a time, only rousing herself when any one approached the table, on which stood an ink bottle and a stylographic pen. The nurse having occasion to send a message to the doctor attempted to write with this pen, the young girl at that time being asleep. The pen not only refused to write, but the practiced eye of the nurse instantly recognized in the point the puncturing needle of a hypodermic syringe. This led to an examination of the ink bottle. It was a four ounce bottle, but there was no ink in it. It was painted black on the outside, and contained Magendie's solution of morphia, enough for 128 one-half grain doses, or sufficient to last until the Christmas holidays. The principal of the school was summoned immediately, and the sleeping girl's arm bared. It was punctured from the shoulder almost to the hand, and the livid blue marks confirmed the suspicion, which was changed to absolute certainty by the small abscess which had begun to form in the forearm just above the wrist. The habit had been formed about two months only, and there is a possibility that a cure can be effected.

THE carriage which was made by the United States government especially for the use of Lafayette during his visit to this country in 1824 is owned in Chicago. It is a quaint old ark, hung on big springs and wide straps, and from his lofty seat the old Frenchman used to descend to the ground by steps with many foldings.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. John B. Butts, of Kansas City, Mo. This invention furnishes an improved construction for raising the pin and retaining it in elevated position, so that a car may be bumped or shunted without coupling with an opposing car, and provides a means for retaining the link in suspension outside the drawbar when the cars are in an uncoupled position, with other novel features.

A railroad signal has been patented by Mr. Robert D. Anderson, of Ethel, La. A small lantern house is located conveniently to the track, suitably provided with lenses, and with a weighted curtain to roll or unroll in place of a flag, and this apparatus is so connected by an operating cord with the railway office that an order cannot be taken there by telegraph for a train without taking down a manifold clip controlling and operating the signal.

A railway switch has been patented by Mr. James B. Suffern, of Hillburn, N. Y. It is intended to be operated by the locomotive, without applying any fixtures to the locomotive, and consists in the combination with a track lever of a locking and releasing device connected with the switch bar, to move the switch bar when engaged by the car wheels, to close the switch, or to release the track lever, so that a passing train will produce no effect upon the switch bar.

AGRICULTURAL INVENTIONS.

A corn or cane harvester has been patented by Mr. Theodore Merrell, of Dixon, Ill. The invention covers various novel parts and details of a gathering and cutting mechanism, with shields extending over the wheels to prevent the severed stalks coming in contact therewith, and is an improvement on a machine which has been the subject of two former patents issued to the same inventor.

An attachment for harrows has been patented by Mr. James D. Armstrong, of Effingham, Kansas. The harrow is made with runners and a system of levers, whereby the teeth may be raised and lowered at will, or entirely withdrawn from the ground to enable them to be transported from place to place without inverting them or employing a wagon for their conveyance.

MISCELLANEOUS INVENTIONS.

A snap hook has been patented by Mr. Sidney S. Stahl, of Connellsville, Pa. The hook is provided with a snap spring normally resting against its inner surface, and has a spring-actuated latch adapted to lock the spring in such position.

A swing saw has been patented by Mr. James Martin, of Brooklyn, N. Y. This invention covers a construction whereby the saw is made to cut in a straight line parallel with the table or cutting surface, for changing its direction of cut to a variable angular relation, and so as to cut at different depths.

An ash sifter has been patented by Mr. William Coughlin, of New York City. A cylindrical sifter is mounted on a shaft to be rotated by a crank, and is provided with sifting bars, a spirally arranged plate, and agitators, with other novel features, to effectively separate the ashes from cinders and other bodies.

A collapsible carton has been patented by Mr. William Wright, Jr., of New York City. It is made with removable and collapsible end pieces, and a knock-down frame placed upon the inside, being more particularly designed to imitate boxes in which medicines, small bottled groceries, and other goods are packed.

An excavator has been patented by Mr. Howard W. Roop, of McMeekin, Fla. It has a shore pulley with driving mechanism, a bog anchor and its pulley, an endless cable and excavator bowls, with other novel features, the invention being an improvement on a former patented invention of the same inventor.

A duplex time ticket has been patented by Mr. William W. Currie, of Smith's Falls, Ontario, Canada. It is for keeping a record of the services of employes, the tickets being in exact register, and the various entries punched in both simultaneously, so that the duplicate must agree with the original when presented for settlement.

A music leaf turner has been patented by Mr. Albert J. Cole, of Waterloo, Iowa. The invention covers novel features of construction and the combination of parts in a mechanically operated device for automatically turning leaves of music for the convenience of the performer, and adapted also for turning the leaves of books.

A variable ticket has been patented by Mr. William E. Waller, of Rutherford, N. J. It is composed of individual characters, as letters, figures, etc., having pins, hooks, or equivalent devices for fastening them to goods, and connected by separable joints, the joint sections on each character interlocking with those on the adjacent character.

A mechanical movement has been patented by Mr. Dennis H. Bennett, of Allendale, Mich. This invention covers a novel construction and arrangement of parts for converting motion derived from a prime motor, to produce a rapid and powerful oscillating motion, which may be utilized for various industrial purposes.

A trunk strap has been patented by Mr. George A. Berry, of Colorado Springs, Col. It is provided with a separate loop, independent of the buckle, to take the initial strain, so that the buckle is left entirely free during the act of drawing up the strap, and the buckling may be effected with ease, no matter how tight the strap may be drawn.

A lifter and carrier has been patented by Mr. Franklin P. Keller, of Sabula, Iowa. It consists of bars with handles at their ends and plates having teeth, supports working on the bars, and chains or other means of suspending the article to be carried from the bars, to facilitate the lifting and carrying of barrels, stoves, and other heavy articles.

A necktie fastener has been patented by Mr. August Larson, of Chicago, Ill. It has a main plate having a button hole, and a locking plate movably connected with the main plate, with one of its side edges arranged in a line intersecting the button, with a notch movable into and out of register with the button hole, whereby the necktie may be easily applied and then locked in place.

A steering gear for ships has been patented by Mr. Oliver Adams, of Larchmont, N. Y. Combined with the rudder post is a beveled gear attached thereto, a shaft supported above the gear carrying pinions meshing with the gear, to be interchangeably keyed to the shaft, which has a hand wheel, whereby the rudder may be made to turn in the same direction with the wheel or in an opposite direction.

A stencil printing machine has been patented by Mr. Charles N. Jones, of Ann Arbor, Mich. The invention covers a novel construction whereby the printing frame is so mounted that it is controlled by springs and treadle, leaving the operator's hands free for use in the actual printing and handling of the sheets, and a diaphragm is interposed between the stencil and the ink or pressure roller, to protect the stencil.

A fence has been patented by Messrs. Henry T. Lee and Charles Protsman, of Tullahoma, Tenn. This invention relates to fences made in panels formed of rails held together by looped wire hangers and supported upon inclined stakes, the parts being interchangeable, and the fence being such as can be erected or removed by a single person, one piece at a time, until finished.

An automatic alarm for drip pans has been patented by Mr. William Williams, of Brooklyn, N. Y. In connection with a float within a chamber of the vessel whose overflow is to be indicated, simple but novel means are provided whereby a series of alarms will be rung after the water or fluid has reached a predetermined height, thus obviating the danger of overflow.

An insecticide has been patented by Mr. William A. French, of Senatobia, Miss. It is to be used on live stock, for exterminating gnats, flies, and similar insects, and cure the poison from their bites, and is made of lard, coal oil, corrosive sublimate, alcohol, cobalt, benzine, sulphur, and other ingredients, in certain proportions and compounded in a specified manner.

A ventilating heater has been patented by Mr. Asa Weeks, of Minneapolis, Minn. It consists of an auxiliary stove mounted on a lower stove and surrounded by a jacket, the design also embracing a combined open and closed stove, the open stove having a casing or jacket at its rear, and the closed stove mounted on the open stove having a casing or jacket inclosing it and the pipe of the open stove.

A submarine torpedo has been patented by Messrs. Timothy Sullivan and Ernest L. Etheridge, of New York City. Its casing is composed of two main cylindrical sections connected to a central section, the rear section holding a rocket composition which propels the torpedo, the central section having radial rudders for steering it, and the front section being charged with gun cotton or other violent explosive.

A safety transparent box has been patented by Mr. George W. Smith, of Union City, Ind. It is cut from a single sheet, and has an outer and inner section, a closed end and inner and outer flap, the sides or bottoms having openings for the disclosure of the contents, being designed for the transmission of money or other articles, so that the contents may be seen to discover loss.

A bustle has been patented by Messrs. Edward D. and John Fraser, of Brooklyn, N. Y. It is formed from a single length of wire bent to the form of a volute spiral, the several coils being brought together and secured and the whole attached to a waist band, the bustle being quite pliable, and collapsing when subjected to direct pressure from the back without bulging at the sides.

An opera glass has been patented by Mr. Frederick Scheidig, of New York City. It is pivoted in a casing having a handle, with means for moving it into a position at right angles with the casing, and means for adjusting the focus while in the latter position, whereby it may be held very conveniently to the eyes, can be focused easily, is ornamental in appearance, and handy to carry.

A crate for shipping and packing hats has been patented by Mr. Sven P. Svensson, of Orange, N. J. It consists of parallel frames pivoted to each other, having attached transverse cords or lines adapted to engage and clamp the hat brim, and so spaced as to hold one hat independent of the other, so that the crate may be thrown upon either side or end without disarranging or injuring the hats.

A combined hot air and steam heating apparatus has been patented by Mr. John H. Waterman, of Cheboygan, Mich. Combined with a boiler and its inclosing heater and ash pit are an air supply chamber and pipe for conveying air to or above the fire, a damper to control the draught, and an automatic steam regulator adapted to simultaneously control both valves, the construction being well adapted for burning natural gas.

An instrument for describing circles has been patented by Messrs. Theophilus A. and Samuel B. Wylie, of Bloomington, Ind. The arm of the instrument is pivoted to turn upon an annular base as a center, and is adapted to hold a crayon or other marker in contact with the surface on which the instrument may be used, the device being more especially designed for school use in drawing circles and geometrical figures on a blackboard.

The desulphurizing and purifying of petroleum oils forms the subject of a patent issued to Mr. Daniel M. Kennedy, of Petrolia, Ontario, Canada. The process consists in first preparing a solution of sulphate of copper, caustic soda, and chloride of sodium in water, then mixing the solution with the oil and heating the whole in a still and subsequently separating from the oil the combined metallic matter of the solution and sulphur in the oil.

A fence post has been patented by Mr. Louis Gratton, of Friendship, N. Y. It has a fixed bed, with short and long braces attached to the post at their upper ends and interlocking upon the bed, the longer braces having integral horizontal arms resting on the bed and terminating in vertical legs adapted to be driven into the ground at the end of the bed, so that no post holes need be dug and the posts are supported at a distance from the ground.

A dust collector has been patented by Messrs. William and James Comerford, of Rathdrum, Wicklow County, Ireland. It is a machine with an air filter of layers of granular material between perforated walls, with provision for constant renewing of the filtering medium, through which leads an air chute conducting the dust-laden air from grinding or other machinery, exhaust fans being used when desired for increasing the draught.

A combined ticket case and diagram has been patented by Mr. David D. Grant, of Franklin, Pa. The diagram represents the arrangement of the seats in a theater or other place, and has on its face pockets over or on the seat marked portions to receive and expose correspondingly numbered tickets, whereby the purchaser can see the tickets left for sale and the relative positions of the seats, the device being made flat, with or without a cover, or so as to fold conveniently for transportation.

A drawing board has been patented by Mr. Casimir M. Podgorski, of Northampton, Mass. Combined with the drawing board are strips attached to the upper surface, within its edges, and made to be adjusted upon a pivot at one end, the strips being formed with slots, in combination with slots in the supporting frame, whereby the T-square can be adjusted at any time to any line, no matter if the board and square are out of true, or the paper stretched or shrunken.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) **O. S. B. asks how magnesium ribbon** is made. A. The metal is first obtained either by chemical means or by electrolysis from one of the compounds of magnesium. The usual commercial process is that of Caron and Deville. A mixture of 600 grammes of chloride of magnesium, 480 grammes of finely powdered fluor spar, and 220 grammes of sodium in small pieces is thrown into a red hot crucible, which is then closed with the cover. After a short time a violent reaction takes place, and as soon as this is complete, the contents of the crucible are stirred around with an iron rod, in order to unite the small globules of metal into larger masses. The metal thus obtained contains several impurities, which may be eliminated by distillation. For this purpose the crude magnesium is placed in an iron crucible having an iron tube passing through from the bottom to within an inch of the lid. The crucible is filled with the crude metal to the level of the mouth of the tube, the lid carefully screwed and luted down, and the air displaced by a current of hydrogen or coal gas. As the crucible becomes heated, the magnesium distills over, passing through the upright tube into a box placed below, where on the completion of the operation it is found in the form of a coherent mass, which is subsequently melted and cast into ingots or any other form that may be required. By special machinery invented by a Mr. Mather, the metal is pressed when in a semi-fluid state into wire of varying thicknesses and of any required length, and this afterward flattened by pressure into ribbon. The recent decline in the price of magnesium is due to recent improvements in the process. The chemical brightness of the sun at a zenith angle of 67° 22′ is only 36·6 times as great as that of magnesium, hence the value of this light as a source of chemically active rays for photographic purposes becomes at once apparent. 2. How is a good screen for a magic lantern made? A. To make an opaque white screen, coat heavy canvas twice with a calcimine solution containing a little glycerine or molasses, which prevent cracking. Lantern slides are colored with dilute aniline solutions. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 423, for full particulars.

(2) **E. G. R. asks how to make a bellows** for a photographic camera. A. There are two ways. One of the simplest is described on page 837 of the December 31, 1886, issue of the *Photographic News*. A sheet of heavy rubber cloth, large enough when folded over a box to form a complete bellows, is marked off in uniform spaces and then carefully folded up and pressed. By a series of cross folds the corners are made so that the whole will readily elongate. Full directions with illustrations may shortly appear. The inside of the bellows should be blackened with French polish, having ground with it a small quantity of lamp black powder. Very little should be mixed at a time, as it evaporates quickly. For the outside use shellac varnish blackened with lamp black, adding a very small amount of glycerine.

(3) **W. R. asks how to blacken inside** of a common bellows. A. See formula given to E. G. R., above.

(4) **White Arrow asks (1) how to make** gold paint, for gilding frames, etc. A. The process is a secret one. 2. How to cure shiny and greasy-looking face. A. Frequently washing with water, or with a solution of Rochelle salts in water, or, if the trouble is caused by bad digestion, consult a physician. 3. How to remove corns on feet without pain or great inconvenience. A. Use the following: Salicylic acid 30 parts, extract of cannabis indica 5 parts, collodion 240 parts. Mix, and apply with a camel's hair brush. 4. How to cure or prevent bone felon? A. As soon as it is felt, put directly over the spot a blister of Spanish fly, about the size of the thumb nail, and let it remain for six hours, at the expiration of which time, directly under the surface of the blister, may be seen the felon, which can be taken out with the point of a needle or lancet. 5. How to make an ink that writes black, remains black, and is really a jet black ink? A. See recipes given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 157. 6. How to make a liquid polish for shoes that requires no rubbing to produce a shine. A. The well-known English liquid blacking of Day & Martin is said to be made as follows: Mix very finely ground animal charcoal, or boneblack, with enough sperm oil to thoroughly impregnate the mass, then add raw sugar or molasses, mixed with a little vinegar, and thoroughly incorporate. A small measure of dilute sulphuric acid is now introduced. Too much will be injurious to the leather, and too little will not make so good a polish, but exact directions cannot be given. When all effervescence has stopped, but while the compound is still warm, add vinegar until the mass is as thin as desired for bottling. 7. How to make luminous ink that may be read at night. A. See "How to Make Luminous Paint," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 249. 8. Is there any certain and quick cure for headache and toothache? A. See "Headaches and their Treatment," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 258. 9. How to make a tooth powder that will cleanse the teeth thoroughly, leaving them spotlessly white? A. Take of dry hypochlorite of lime ½ drachm and 2 drachms precipitated chalk, triturate together and mix thoroughly. This will, however, eventually injure the enamel of the teeth.

(5) **D. T. asks if any of our readers have** any knowledge of a microphone having the contact points made of platinum, which will reproduce articulate speech.

(6) **F. N. P. asks for a cement to make** tight a wood photographic developing tray having a glass bottom. A. Coat the wood sides with asphaltum varnish and cement the joints with a cement made as follows: Melt together 1 part of pitch, 1 part resin, and 1 part plaster of Paris (perfectly dry).

(7) **E. A. L. asks what the process is** and apparatus necessary to manufacture flake litharge. A. In a general way, metallic lead is heated on the hearth of a reverberatory furnace. The oxygen of the air oxidizes the surface of the lead to litharge, which is scraped off.

(8) **W. B. B. asks the proper mode of** covering machinery pulleys with leather to prevent slipping of belt. I have tried lacing, but with poor success. Is there any cement I can use between the pulley and leather? A. Clean the pulley of all grease or oil, then scratch the surface all over with a rough file. Make a long scarf on one end only of the leather band, and the band a little wider than the pulley at the scarf, which will better facilitate drawing it tight. Use the best isinglass glue, and draw and clamp the thick end over the scarf. When dry, trim the thick end to an even curve.

(9) **D. F. N.—1. The only tree-like** plants that produce their fruit without the intermedium of blossoms are tree ferns. 2. To promote the growth of the hair, have the following preparation made, and apply it twice a day to the scalp by means of a soft sponge:

Tr. nux vomica	2 drachms.
Carbolic acid	½ "
Tr. cinchona	1 ounce.
Tr. cantharides	½ drachm.
Cocoanut oil and cologne water, sufficient to make a 4 ounce mixture.	

(10) **A. S. S. asks: What will remove** the stain of iodine from the hair of a horse without injury to the horse or hair? A. Ordinary aqua ammonia will remove the stain instantaneously.

(11) **J. N. P. asks the greatest perpendicular** depth ever reached in the earth by well or mine. A. The deepest well is at Schliedenbach, Prussia. It is 4,300 feet deep. The deepest mine in Great Britain is the Rose Hill colliery, 2,445 feet deep, and a mine at Andreasberg in the Harts Mountains is 4,500 feet deep.

(12) **D. D. M. asks: Can electro-plating** plating dynamos be used to run electric lights, arc or incandescent? How many to a small plating machine? A. An electro-plating dynamo gives electricity of too low tension for electric lights, except the very smallest incandescent or specially constructed ones of low resistance.

(13) **F. P. asks: What substance will** bleach wax, such as used for producing artificial flowers, etc., and also how to use same in order to obtain satisfactory results. A. Melt the wax in a jar, and put into it powdered nitrate of soda, in the proportion of 1 ounce to the pound of the wax. Afterward add by degrees 2 ounces to the pound of sulphuric acid, diluting with ten times its weight of water, keeping the wax warm and stirring the while. Let it stand a short time, and then fill up the jar with hot water, and allow the whole to cool. The wax should then be white. Afterward wash with water to remove any nitric acid that may remain, as it would make the wax yellow.

(14) **D. F. F. asks concerning the quantity** of fulminate mercury used in paper torpedoes and also of the preparation of fulminate mercury. A. The quantity varies considerably. Its preparation is as follows: One part of mercury is dissolved in twelve parts of nitric acid; the solution mixed with an equal quantity of alcohol; and gentle heat is applied, the reaction, if too violent, being moderated by adding more spirit from time to time. The mercuric fulminate separates from the hot liquid, and after cooling may be purified from an admixture of reduced metal by solution in boiling water and recrystallization.

(15) **S. G. C.—The fungus which you** send to be named is a species of puff ball popularly called "earth star," from the stellate divisions of the external coat (peridium); whence also the scientific name *geaster*, a Greek word having the same meaning. There are quite a number of species, but none of them is very common. Some of them are extremely sensitive to moisture, and are driven about as shapeless masses by the wind till the first shower expands them. Others, on the contrary, expand when dry and contract when moist.

(16) **W. C. I.—The plant is a native of** Southern Florida, and would not endure the cold of a northern winter. The root should be lifted before the ground freezes.

(17) **C. J. C. asks whether there is such** a chemical compound as "hydric tartrate." A. "Hydric tartrate" is one of the terms used to designate tartaric acid, which, strictly speaking, is hydrogen tartrate.

(18) **F. B. J. asks if there is an acid** that will eat off printer's ink from a card without eating the card. A. No.

(19) **D. H. B. desires a recipe for a superior** liquid glue. Something that could be manufactured largely under a copyrighted name, and stand the tests of these other goods now on the market. A. Take of best white glue 16 ounces, white lead, dry, 4 ounces, rain water 2 pints, alcohol 4 ounces, with constant stirring, dissolve the glue and lead in the water by means of a water bath. Add the alcohol and continue the heat for a few minutes. Lastly pour into bottles while hot.

(20) **G. W. R. writes: Is there a black** copying ink that can be used upon the glycerine copying pads? A. Use a strong aqueous solution of soluble nigrosine (aniline black), in the proportion of about 1 to 5 or 7 of water, to which a little glycerine may be added. It is not as satisfactory as the violet ink, however.

(21) **M. E. writes: I have a handsome** piece of statuary, composed of zinc which had been finished in imitation of bronze, that has become soiled. How can I finish it? I do not want a gold finish, but the dark bronze. A. There are various colored lacquers used for this purpose. Of these, a dark gray bronzing is made by mixing 1 drachm protochloride of tin and 1 drachm sulphocyanide of potassium with 1 pint of water.

(22) **F. W. S. asks in which there is the** greater per cent of heat, in hard coal screenings or soft coal screenings. A. There is but very little perceptible difference in the heat. The variation in the amount of ash makes the principal gross difference, and this is as variable in the bituminous as in the anthracite. Some claim an excess of heat in bituminous, from its larger percentage of hydrogen.

(23) **S. G. B. asks how to solder cast** iron and tin ware together. A. It is a very difficult matter to tin cast iron. The surface to be tinned may be made perfectly clean with a file; then use pure tin with a tinner's copper or soldering iron. Rub the surface with sal ammoniac. At the same time apply the hot tinning iron and the tin. Tinner's acid (muriate of zinc) applied freely will facilitate the flow of the tin, if it does not readily take at the first effort.

(24) **H. N. B. asks the full name of the** Emperor of Germany (the man that is 90 years old). Also his father's and mother's full name. A. Frederick William Louis Hohenzollern; he is the son of Frederick William III. and Louise Amelie Wilhelmine Auguste, of Mecklenburg-Strelitz.

(25) **W. H. A. writes: I have a piece** of buhl furniture, and the brass fretwork is coming out. Can you give me the recipe of some glue or cement to fasten it on with? A. Use a cement made by mixing together 4 parts of good glue and 1 part Venice turpentine.

(26) **C. F. D. asks: What will be the** result of placing shellac varnish over preservative or other varnishes? Will it be likely to crack in a short time? A. Shellac is about the hardest of gums. Put on over other varnishes that are perfectly dry, and with good surface it should make a fine hard finish.

(27) **A. J. S. desires a receipt for a** strong cement that will mend bisque. A. Burn some oyster shells, reduce to powder in a mulier, and pass through a fine sieve; make this into a paste with white of egg. The shells should be thoroughly cleaned, well burned, air slaked, and finely powdered, making simply a fine article of lime. The parts joined must be held firmly together for two minutes or so after the cement has been applied. Be sure the parts are thoroughly clean before joining.

(28) **J. E. P. desires information in re**gard to washing blankets and woolens without making them shrink. A. Scrape 1 pound soda soap, and boil it down in sufficient water, so that when cooling you can beat it with the hand to make a sort of jelly. Add three tablespoonfuls spirit of turpentine and one of spirit of hartshorn, and with this wash the article well and rinse in cold water until all the soap is taken off. Then apply salt and water and fold between two sheets, taking care not to allow two folds of the article washed to tie together. Smooth with a cool iron. Only use the salt where there are delicate colors that may run. If you can get potash soap, it will be better, as woolen manufacturers do not use soda soap.

NEW BOOKS AND PUBLICATIONS.

NYSTROM'S POCKET BOOK OF MECHANICS AND ENGINEERING. Pp. 670. Philadelphia: J. B. Lippincott & Co. Price, $3.50.

The nineteenth edition of this very comprehensive and most useful manual has been revised and corrected by Professor W. Dennis Marks, of the University of Pennsylvania. The present editor has added an article on dynamic electricity and one on the expansion of steam, but has confined himself principally to corrections of English and the formulæ of previous editions.

THE RELATIVE PROPORTIONS OF THE STEAM ENGINE. By William Dennis Marks, Ph.B., C.E. With numerous diagrams. Philadelphia: J. B. Lippincott Co. 1887. Pp. xxi, 283. Price, $3.00.

This is the third edition of this useful manual. It is a collection of, or compiled from, a series of lectures. In it every imaginable factor of the steam engine is studied and formula deduced. Indicator diagrams, crank angles, link and valve motion are all fully treated of. In order to enable the engineer to enter his own notes and observations, blank leaves are bound in between the printed leaves. Some personal and practical notes give more animation to the book than the subject would seem capable of affording.

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